

## Technical Information Sheet ED015

# Acoustic Performance of Light Steel Construction

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This Information Sheet describes the benefits of light steel construction in relation to acoustic performance. Acoustic performance is an important design consideration for many building types, especially housing and other residential buildings, hotels, schools and hospitals.

### Key Benefits

The benefits of light steel construction in relation to acoustic performance are:

- High levels of acoustic performance can be achieved.
- Light steel construction utilises multiple layers of construction, which are ideal for providing high levels of acoustic insulation.
- Light steel products such as 'acoustic' studs and resilient bars are specifically designed to reduce sound transmission.
- Junctions can easily be detailed to minimise flanking sound.
- The high quality assurance ensures repeatable acoustic performance.
- There is a wide variety of proven light steel wall and floor construction systems.

### Sound Insulation

The primary acoustic performance characteristic of walls and floors within a building is the amount of sound insulation they provide, which is defined by the sound reduction across the element. The reverberation of sound within a room can also be a consideration but this is predominantly governed by the wall and floor surface finishes or covering rather than the form of construction.

There are two types of sound to consider:

- Airborne sound – important for walls and floors
- Impact sound – only relevant for floors.

The acoustic requirements of residential buildings are normally given in national building regulations and associated guidance documents. For England and Wales, acoustic performance requirements are given in Part E of the *Building Regulations* and in *Approved Document E*. Similar equivalent documents exist for use in Scotland and Northern Ireland. Acoustic requirements for other building types are usually provided in sector-specific documents such as *Building Bulletin 93* for schools and *HTM 08-01* for hospitals.

The general acoustic requirements for residential buildings in England and Wales are:

- Airborne sound reduction:  $D_{nT,w} + C_{tr} \geq 45$  dB for separating walls and floors, and  $R_w \geq 40$  dB for internal walls
- Impact sound transmission:  $L'_{nT,w} < 62$  dB for separating floors.



**Light steel student accommodation**  
(Image courtesy of Futureform and Ayrshire Metal Products)



**Hospital building in Scotland using light steel framing**  
(Image courtesy of BW Industries)

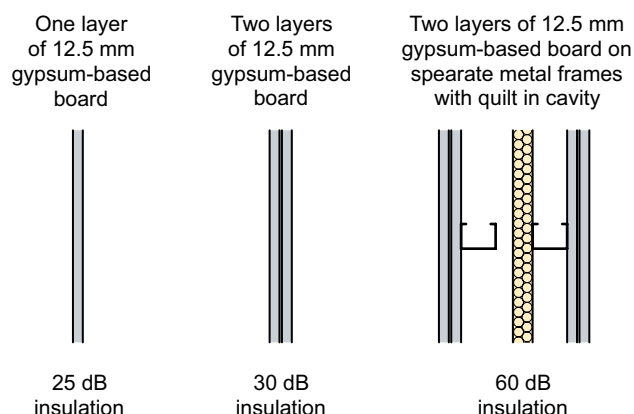


**Acoustic testing equipment in a light steel development**

## Acoustic Performance of Light Steel Walls

Light steel walls consist of vertical steel C sections, mineral wool and lining boards. The exact specification of these products and how they are used together has a significant effect on the acoustic performance of the wall.

One of the most effective techniques for providing sound insulation is to provide multiple layers of construction, e.g. plasterboard – insulation – plasterboard, see Figure 1. Light steel lends itself to this type of construction, enabling high levels of sound insulation to be achieved.



**Figure 1** Sound insulation by separated layers

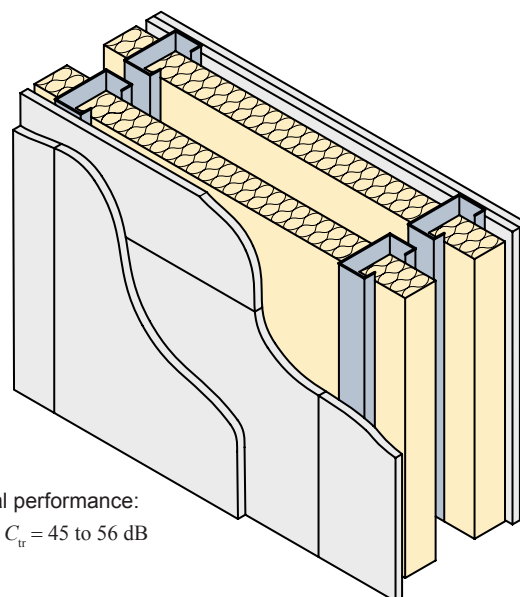
The acoustic performance of a building can be sensitive to the quality of the workmanship. The off-site nature of light steel and modular construction helps to ensure consistent quality and therefore predictable acoustic performance.

### Separating Walls

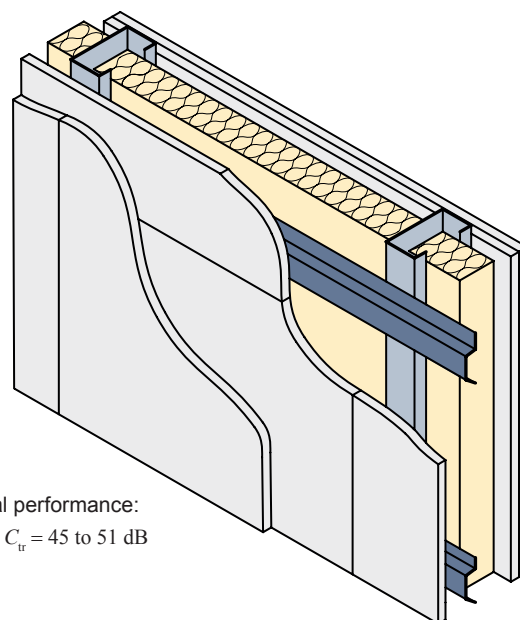
There is a wide range of possible light steel separating wall constructions; a few examples are shown in this information sheet.

Figure 2 shows a typical light steel separating wall with two frames, both lined with two layers of board on one side and mineral quilt between the studs of both frames. A separating wall in modular construction is similar except that it will normally have a layer of sheathing board on the cavity side of each frame.

Figure 3 shows a single frame separating wall with resilient bars on one side. Resilient bars are used to increase the sound insulation by absorbing vibrations. The bars are fixed to the light steel frame and are used to prevent direct contact with the lining board. Acoustic performance is enhanced further by using resilient bars on both sides of the wall.



**Figure 2** Twin light steel frame separating wall



**Figure 3** Single light steel frame separating wall with resilient bars (on one or both sides)

The addition of resilient bars is not detrimental to the fire performance of a wall.

### Internal Walls

Internal walls within dwellings typically consist of a single light steel frame with mineral wool quilt between the studs and a single layer of lining board on each side.

## Acoustic Performance of Light Steel Floors

The acoustic performance of a floor is dependent on the construction of the whole floor, which includes the light steel structure, the floor treatment and the ceiling specification. The exact specification of these elements will have a significant effect on the acoustic performance of the complete floor system.

### Separating Floors

The structural solution for separating floors within light steel construction is typically light steel joists, light steel lattice trusses or a composite floor slab using profiled steel decking.

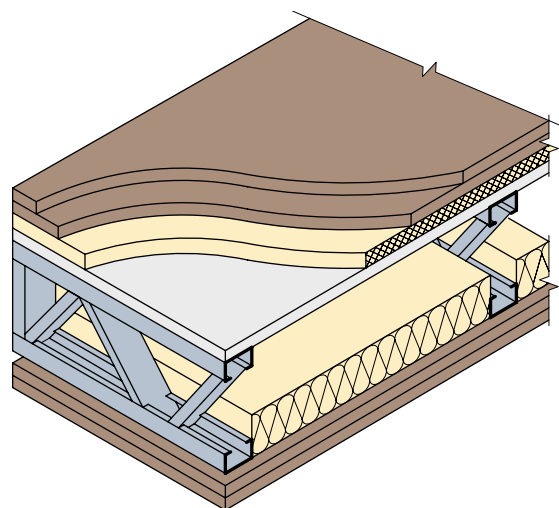
Floor treatments are normally applied on top of the structural floor to enhance the acoustic performance of the overall floor system. These may not be required with composite slabs. Typical acoustic floor treatments include:

- Batten systems – floor boarding supported on battens of varying depths and incorporating resilient foam strips.
- Platform floors – floor boarding supported on a layer of dense mineral wool. For additional performance a gypsum-based board can be included beneath the floor boarding.
- Light weight screed – gypsum-based screed over a waterproof membrane and a layer of dense mineral wool (see Figure 4).



**Figure 4** Placement of light-weight gypsum-based screed on light steel floor  
(Image courtesy of Metek UK)

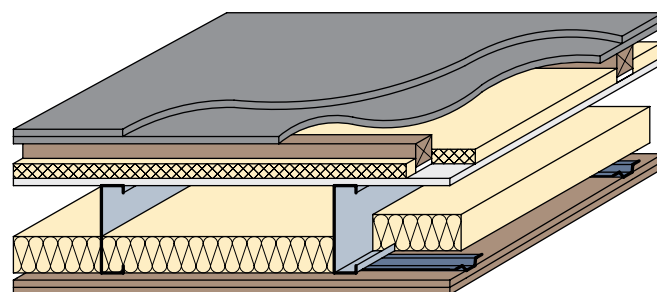
Examples of light steel separating floor constructions and their typical acoustic performances are shown in Figure 5 and Figure 6. When using a joisted floor acoustic ceiling treatments such as resilient bars with boards are required, as shown in Figure 5 and Figure 6.



Typical performance:

$$D_{nT,w} + C_{tr} = 46 \text{ to } 54 \text{ dB}, L'_{nT,w} = 35 \text{ to } 55 \text{ dB}$$

**Figure 5** Light steel lattice truss with a platform floor treatment and two layers of ceiling board supported on resilient bars



Typical performance:

$$D_{nT,w} + C_{tr} = 47 \text{ to } 57 \text{ dB}, L'_{nT,w} = 44 \text{ to } 58 \text{ dB}$$

**Figure 6** Light steel joists with a batten floor treatment and two layers of ceiling board supported on resilient bars

### Acoustic Test Information

Acoustic performance is generally verified by on-site test measurements of completed buildings. On-site tests are more rigorous than laboratory tests because they take account of flanking sound through junctions as well as direct sound transmission through the element.

As a result of past on-site testing, there is a large amount of data that demonstrates the ability of light steel and modular construction to achieve high levels of acoustic performance. SCI publication P371 contains a series of acoustic case studies and provides the acoustic test data for a range of steel framed buildings.

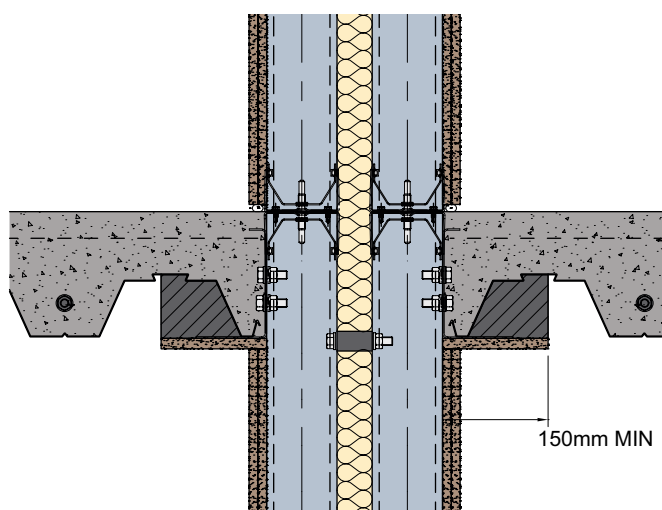
Walls and floors must also be detailed to provide the required level of fire resistance, see SCI-ED016.



## Junction Details

It is important that the junctions between separating elements are detailed and built correctly to minimise local sound transmission through junctions (flanking sound).

An example of a junction detail is shown in Figure 7. The wall boards are not in direct contact with the floor. The gap between the wall boards and the floor is filled with acoustic sealant. Additional mineral wool is placed in the wall in the floor zone to minimise flanking.



**Figure 7 Composite floor junction with light steel separating wall**  
(Image courtesy of Kingspan Profiles & Sections)

## Bibliography

The following publications may be referred to for more information on light steel framing and modular construction.

*Acoustic Detailing for Steel Construction (P372)*  
Way A G J and Couchman G H  
The Steel Construction Institute, 2008

*Acoustic Performance - Case Studies (P371)*  
Way A G J and Lawson R M  
The Steel Construction Institute, 2007

*Robust Details Handbook*  
[www.robustdetails.com](http://www.robustdetails.com)  
Robust Details Ltd, 2012



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## Sources of Information

### Other technical information sheets

The following technical information sheets provide further guidance about light steel construction.

- ED010: Light Steel Solutions for All Applications
- ED011: Light Steel Residential Buildings
- ED012: Light Steel Framed Housing
- ED013: Light Steel Infill Walls
- ED014: Light Steel Modular construction
- ED016: Fire Safety of Light Steel Construction

### Manufacturers

The following manufacturers are active in the light steel and modular construction sector and may be contacted for further information.

Ayrshire Metal Products Ltd - [www.ayrshire.co.uk](http://www.ayrshire.co.uk)

BW Industries Ltd - [www.bw-industries.co.uk](http://www.bw-industries.co.uk)

Fusion Building Systems - [www.fusionbuild.com](http://www.fusionbuild.com)

Kingspan Profiles & Sections - [www.kingspanprofiles.com](http://www.kingspanprofiles.com)

Metek UK Ltd - [www.metek.co.uk](http://www.metek.co.uk)



**Figure 8 Construction of a light steel residential development in Middlesbrough**  
(Image courtesy of Metek UK)

[www.steelbiz.org](http://www.steelbiz.org) – 24×7 online technical information

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