

Slide 1



CIAT – Module 8
Timber and Lightweight Steel
Separating Floors




Welcome to Module 8 – Timber and Lightweight Steel Separating Floors

Additional notes:

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Slide 2



Module Contents

This module will cover the following topics:

- Key Acoustic properties
- Types of joist floors (solid, i-joist and metal web)
- Use of absorption quilt in main cavities
- Subdecks and floating floor treatments
- Resilient ceiling bars and fixings
- Ceiling Linings
- Services and downlighters




This Module will cover the following topics

Read slide

Additional notes:

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Key Acoustic Properties



Combination of components in joisted separating floors:

- Core floor structure
- Decking and sub-decking
- Mineral wool
- Resilient floating floor treatments
- Resilient bars
- Gypsum-based boards for the ceiling

Key acoustic properties of timber floors

- Stiffness**
(by joists and subdeck)
- Isolation & Resilience**
(by floating floors and resilient bars)
- Absorption**
(by mineral wool)

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Timber separating floors involve a combination of components to deliver the required sound insulation.


- Core structural joist floor
- Linings for decking and sub decking
- Mineral wool to provide absorption
- Resilient floating floor layers to provide acoustic damping and isolation
- Resilient bars to provide isolation and resilience
- Gypsum ceiling boards providing mass

Additional notes:

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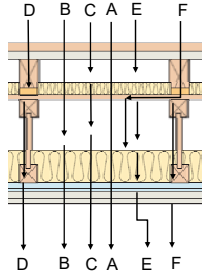
Slide 4

Sound Transmission Pathways through Timber Separating Floors



There are many complex pathways for sound to transmit through a timber separating floor:

- At **low frequencies**, **stiffness** and **mass** are controlling aspects. Pathways are:
 - direct room to room (A)
 - via the cavities (B&C).
- At **mid and higher frequencies** **absorption** is more prevalent; and **isolation** and **damping** are key. Pathways are:
 - via the structural components (D, E, and F)



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There are many complex pathways for sound to transmit through a timber separating floor:

At low frequencies stiffness and mass of the floor are the controlling aspects – main sound pathways are direct room to room (A) and also via the cavities (B&C).


At mid and higher frequencies absorption by the mineral wool becomes more prevalent and isolation and damping become key. Pathways (D, E, and F) via the structural components control mid and high frequencies

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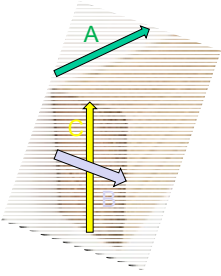
Slide 5

Timber Properties & Sound Transmission



Timber as a material is **non-isotropic**.
This influences the sound transmission within timber structures:

- **Parallel with the grain (A)** wave-speed is high (e.g. 2,000m/s)
- **Crossing the timber rings (B)** radial wave-speed is much lower (e.g. 600m/s)
- **Tangential to the radial (C)** wave-speed between (A) and (B) (e.g. 900m/s)



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Timber as a material is non-isotropic. This means that the material properties vary depending on the direction of the grain. This in turn influences the sound transmission within timber component structures.

Parallel with the grain (A) the sound wave-speed within the timber is high. (e.g. 2,000m/s)

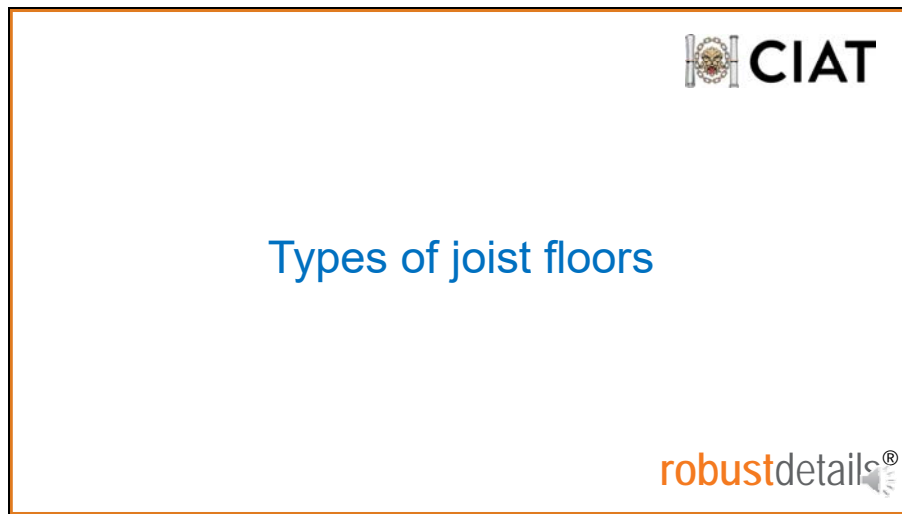
The radial wave-speed crossing the timber rings (B) is much lower. (e.g. 600m/s)

Tangential to the radial (C), the speed is between (A) and (B) (e.g. 900m/s)

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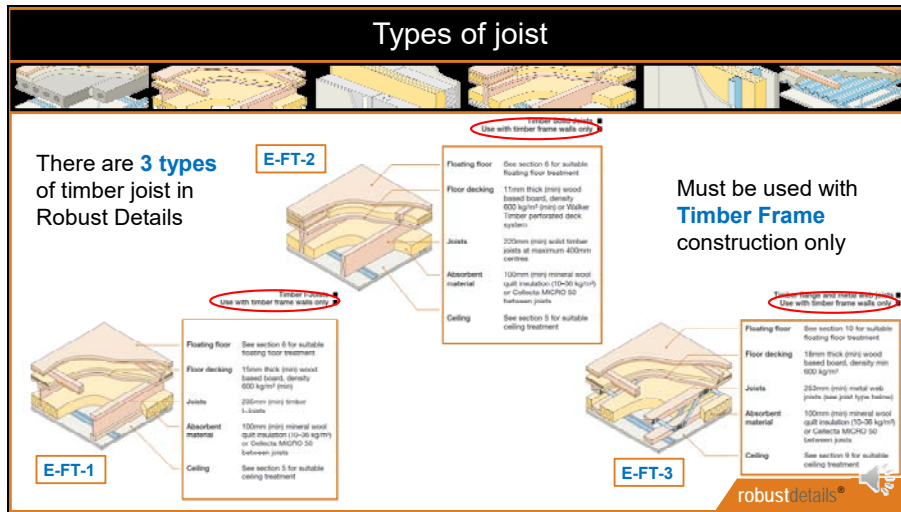
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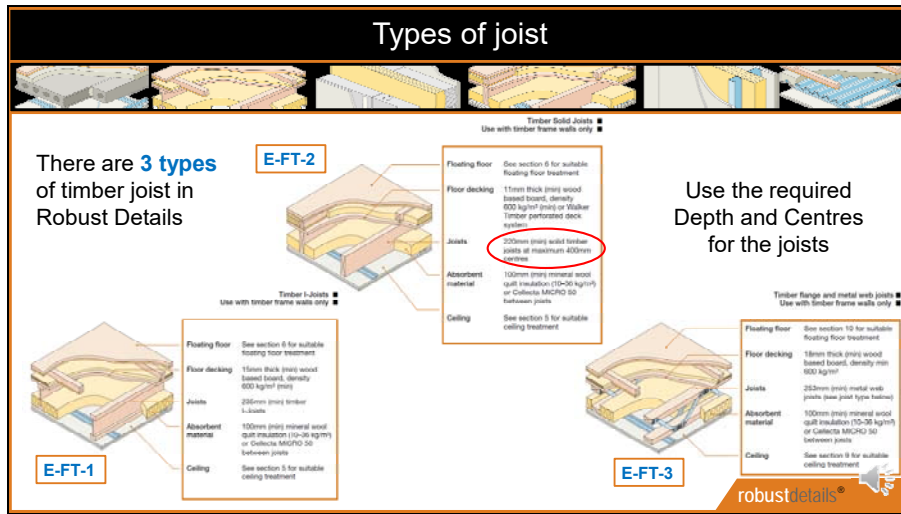
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The Robust Details timber separating floors use three different types of joist, as we can see in these generic floors.

As noted at the top of each, the timber separating floors can only be used with timber frame walls. They cannot be used with masonry walls.

Additional notes:




With no inherent mass to address the mid to low-frequencies, these floors have to rely on their acoustic stiffness.

This is why the joists are specified with a minimum depth and note that the solid joists also have a maximum spacing.

Additional notes:

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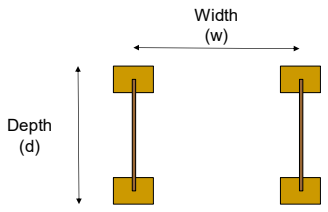
Stiffness of Joists




Stiffness of joists is dependent on their cross section and:

- Joist depth (**d**)
- Spacing (or width) between joists (**w**)

Increasing the **depth** or **narrowing the spacing width** increases the stiffness.



For joisted floors,
Higher stiffness = better low frequency performance

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Stiffness of joists is affected by the material cross section and two key factors:

The joist depth (d)

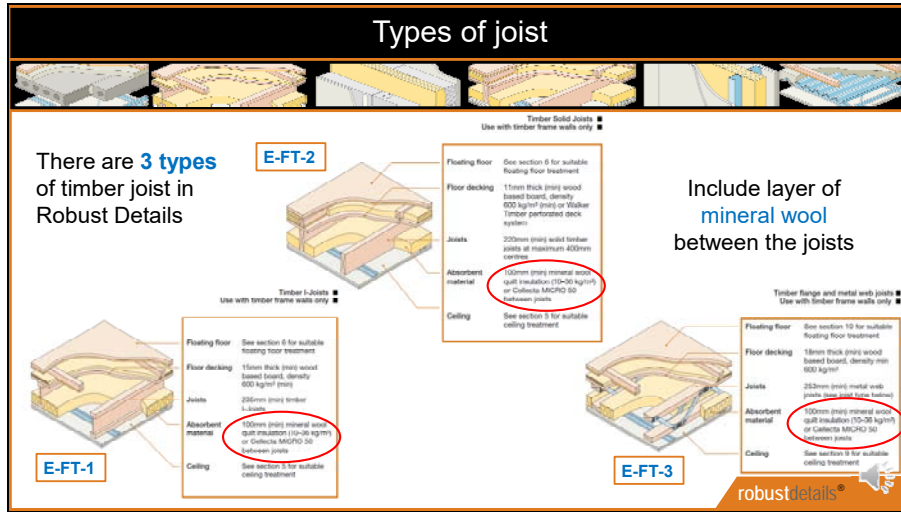
The spacing (w) width (centres) between joists

Increasing the depth and/or narrowing the spacing width increases the stiffness of floors.

The higher the stiffness of a joist floor system the better the sound insulation at low frequencies.

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We also need to ensure that the specified mineral wool is fitted in the joist zone


As we've already discussed, this will contribute to the reducing of mid & high frequency sound transfer (for frequencies 200Hz and above), and also absorbs sound in the joist zone cavities to reduce reverberation.

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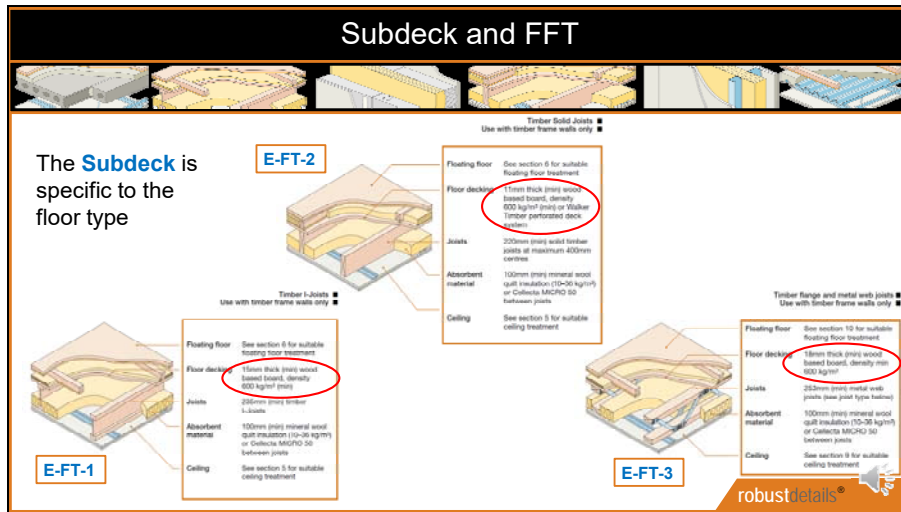
Subdecks and floating floor treatments



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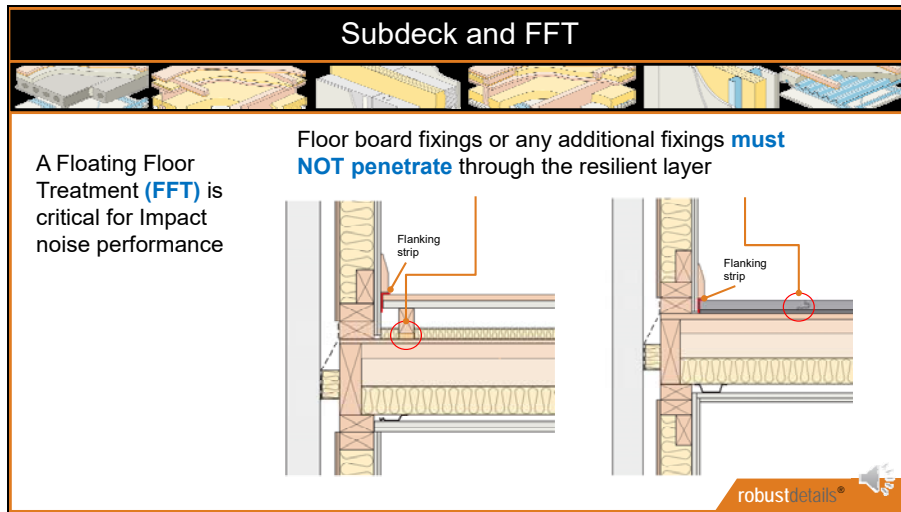


Each of the Robust Details timber separating floors will include a subdeck specification and they will vary from floor to floor.

Not only do these provide a walking surface for when the floating floor treatments are being installed, they also tie the joists together, to add stiffness.

Additional notes:

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The floating floor treatment is an essential part of the floor build-up. As well as adding to the airborne performance, its primary function is to contain impact noise, and reduce it from transmitting into the structure, and into the flat below.

There are two types of FFT in the timber floor Robust Details:
the batten type, or
the platform type.

The battens have a resilient material bonded to them to minimise impact noise getting into the floor structure. The battens can be supplied by anyone, but they must have been successfully tested to our Appendix C. The batten systems also need mineral wool in between them to prevent reverberation in the void.

There is only one approved platform type for timber floors – and this is the ScreedBoard. As this is a proprietary product, it must be supplied by Collecta.

Continued overleaf

Additional notes:

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All FFTs must have a perimeter or flanking isolation strip, shown red in the diagrams, to minimise the amount of impact noise getting into the surrounding structures.

It is important that any floor board fixings, or additional fixings, **must NOT penetrate** through the resilient layer

Additional notes:

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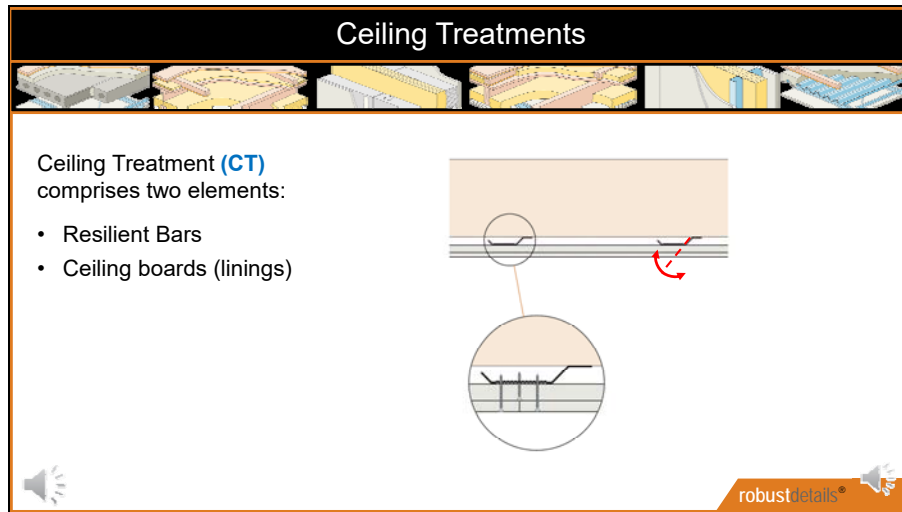


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Ceiling treatments are made up of 2 parts:
Resilient bars; and the ceiling lining itself

The resilient bars have two functions:

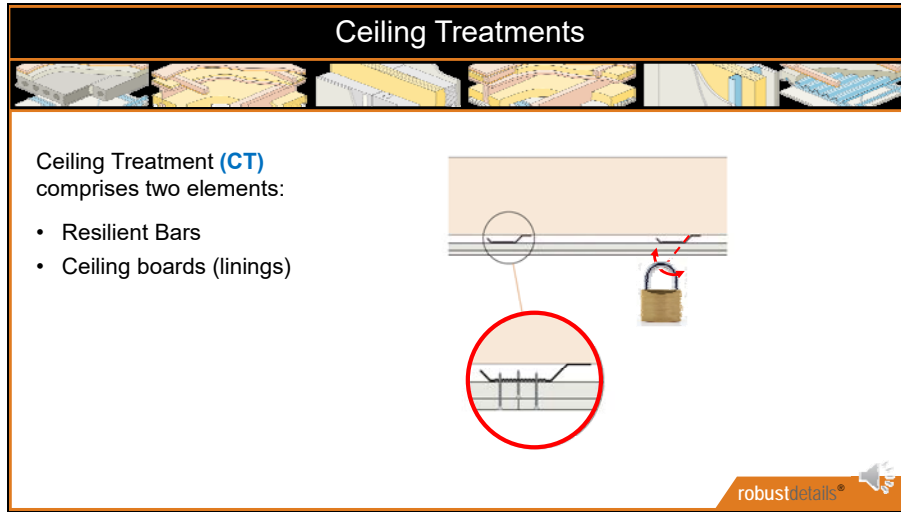
- FIRSTLY they are attached perpendicular to the joists, to tie the joists together and increase the stiffness of the floor
- SECONDLY and crucially, they allow the ceiling lining to float, so that noise energy in the joists does not transmit into the ceiling boards – and vice versa.
- A correctly fitted resilient bar can add 5-8dB to the sound insulation performance of a floor.

The lining will move (or float) in a way that follows the twisting motion of the resilient bar.

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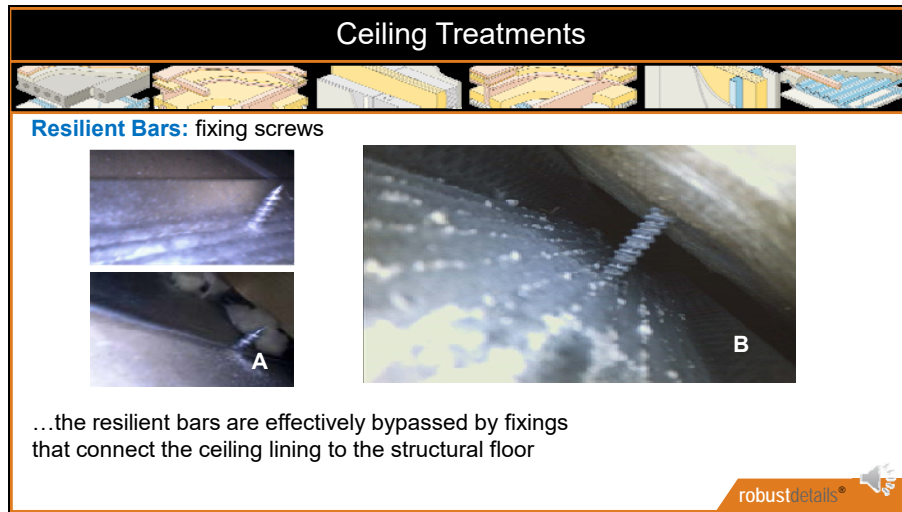
If any of the resilient bars are facing the other way, they will restrain this movement - so make sure they all face the same way.

Also ensure the correct length screws are used

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If the screws are too long, there is a danger they could go into the joist


Image (B) shows where the ceiling board screws used to connect to the resilient bar (only) were in fact too long causing the screw to connect directly with the joist. This rigid connection the of the ceiling board to the joist will have a significant negative effect on the airborne and impact sound performance of the floor.

Additional notes:

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Ceiling Treatments

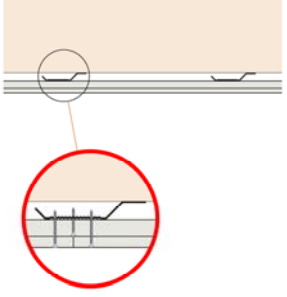


Resilient Bars: fixing screws

Ceiling treatment CT1
Two layers of gypsum-based board, composed of 19mm (nominal 13.5 kg/m²) fixed with 32mm screws, and 12.5mm (nominal 8 kg/m²) fixed with 42 mm screws

Ceiling treatment CT2
Two layers of gypsum-based boards composed of 15mm (nominal 12.5 kg/m²) fixed with 25mm screws and second layer of 15mm gypsum-based board (nominal 12.5 kg/m²) fixed with 42mm screws

...the resilient bars are effectively bypassed by fixings that connect the ceiling lining to the structural floor



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The ceiling lining on timber separating floors always comprises 2 layers of gypsum board, and these could be the same, or different thicknesses

So each of these ceiling treatments will specify the length of screw that should be used to fix each layer.

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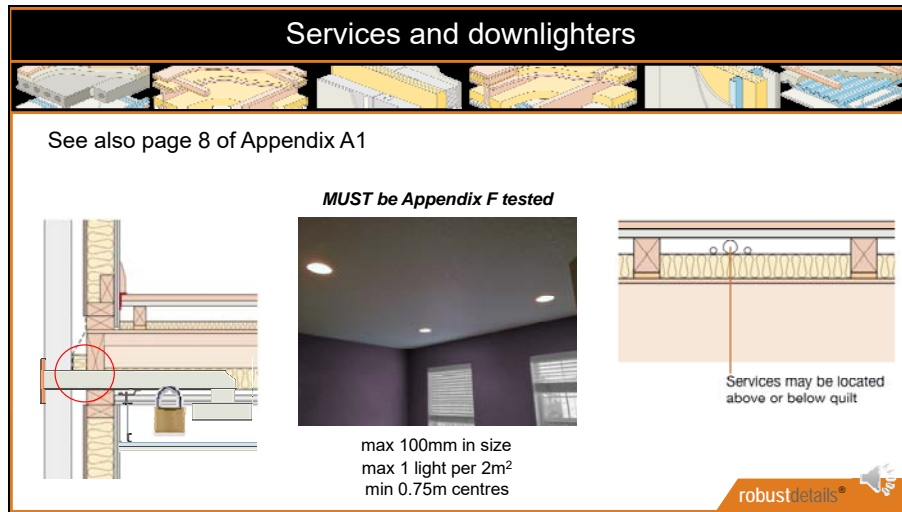


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As we can see here, we need to have blocking between the joists to prevent flanking noise transferring between the external cavity and joist zone
When installing extract fans, the natural method would be like this
But as we can see, this will compromise the blocking.
Also, as the ducting bridges the resilient bars, it can also compromise their performance
So the First option could be to use second ceiling. This will alleviate both of these issues.

Unlike those in concrete floors, any recessed lighting in timber separating floors must be Appendix F tested, and cannot be any larger than 100mm across (i.e. max 100mm diameter)
There can be no more than 1 light per 2 sq.m – so a 10 sq.m ceiling can have up to 5 lights
And they can't be within 750mm of each other

Services can run in the batten zone, and if the services need to go across the line of the battens, a gap of up to 50mm is permitted in battens.

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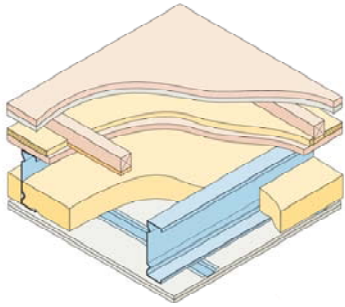
Steel Separating Floors



Like Timber separating floors, Steel separating floors use a **combination of components** to deliver the required sound insulation.

Unlike timber, steel is **isotropic** meaning the same wave-speed (e.g. 4,500m/s) in every direction.

Steel structures have very little inherent acoustic damping.



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Steel separating floors are very similar to timber separating floors involving a **combination of components** to deliver the required sound insulation.

However, steel is isotropic and has the same material properties no matter the direction of the sound waves through the structure.


Sound can travel through steel at 4,500m/s - and as steel structures have very little inherent acoustic damping, care must be taken to get the detailing right.

Additional notes:

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Steel Separating Floors

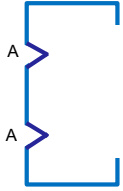


The cross-section of the joists can be “profiled”.


These profiles increase the “acoustic depth” and resilience, which can enhance acoustic performance by 3 - 4dB.



C - Section



Profiled - Section




To increase the effective “depth” of a steel floor beam and improve sound insulation performance, the cross section can be profiled as shown here.

These profiles increased the “acoustic depth” and resilience of the beam, which can enhance sound insulation performance by 3 – 4dB for both airborne and impact sound.

Additional notes:

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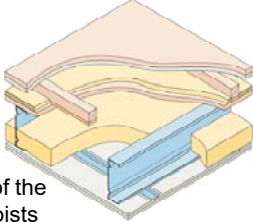
Steel Separating Floors




As with all specifications care should be taken to follow all instructions and guidelines.

Ensure:

- the correct **minimum joist depth** is being specified
- resilient bars are fitted at **right angles** to the direction of the steel joists and ceiling board fixings do **not touch** the joists
- the correct specification for sub-decking, fixings and mineral wool are used
- the correct resilient floor is being specified
- ceiling mass of boards can be supported by the resilient bars

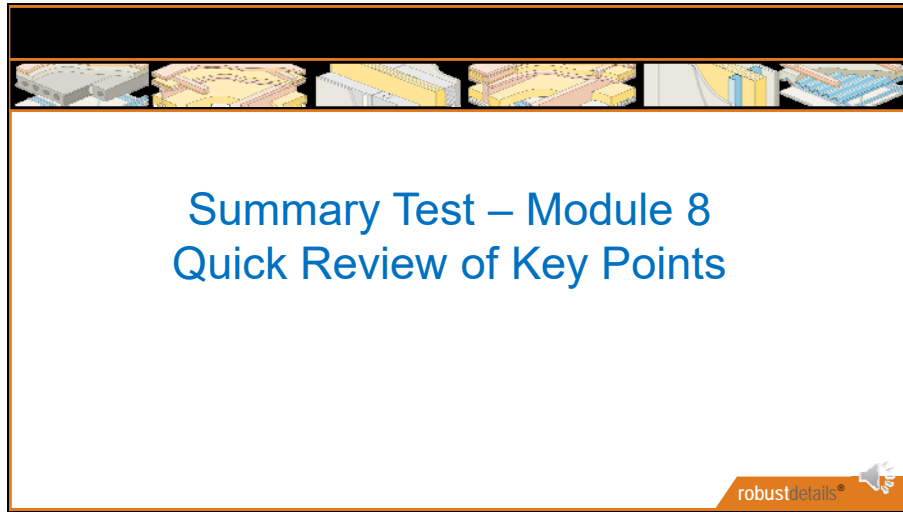


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Additional notes:

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Now for a quick TEST to recap on Module 8


Additional notes:

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Summary Test – Module 8 

| No. | Question |
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| 1 | Stiffness and Absorption are two of the key acoustic properties of timber floors - what are the other two? |
| 2 | Can timber separating floors be used masonry walls? |
| 3 | We can improve the stiffness of the floor by increasing the joists' depth and what else? |
| 4 | In floating floor treatments (FFTs), what is the function of the flanking strip? |
| 5 | The ceiling treatments for timber floors comprise the ceiling board and what other component? |
| 6 | Why is it important to use the correct-length screws to fix the ceiling boards? |
| 7 | When including recessed lighting in the primary ceiling, how many can be fitted in 10 sq.m of ceiling? |
| 8 | Extract ducts can be fitted in the joist zone, but we need to be careful in two areas: breaking through the blocking between the joists; and what else? |
| 9 | Unlike timber, steel is isotropic - but what does this mean? |
| 10 | What is the benefit of introducing fluting, or profiling into the web of a steel joist? |



Here are 10 questions – you may wish to PAUSE the recording and test yourself against these questions.

Once you have answered all of them – the next slide provides the answers. In 10 seconds the slide will change so press pause now if you want to test yourself first.


Thank you for following Module 8.

Additional notes:


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| No. | Answer |
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| 1 | Isolation from the ceiling treatment Resilience from the floating floor treatments and resilient bars |
| 2 | No - they have to be used within full timber frame construction |
| 3 | Reducing the centres of the joists |
| 4 | To stop impact noise energy in the FFT from getting into the surrounding structures where it could transmit to the flat below |
| 5 | Resilient Bars |
| 6 | If the screws are too long, they can go into the joists, and compromise the resilient bars. |
| 7 | 1 light per 2 sq.m - so 5 lights can be fitted in a 10 sq.m ceiling |
| 8 | Ensuring the resilient bars are not compromised by rigidly connecting the ducting to the joist and the ceiling board |
| 9 | Sound waves travel at the same speed in all directions |
| 10 | These profiles increased the "acoustic depth" and resilience of the beam, which can enhance sound insulation |



Here are the answer to Module 8's quick test.
How did you do?

Thankyou for following Module 8

Additional notes:

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End of CIAT – Module 8
Timber and Lightweight Steel
Separating Floors



This is the end of Module 8 - Timber and Lightweight Steel Separating Floors

Additional notes:

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