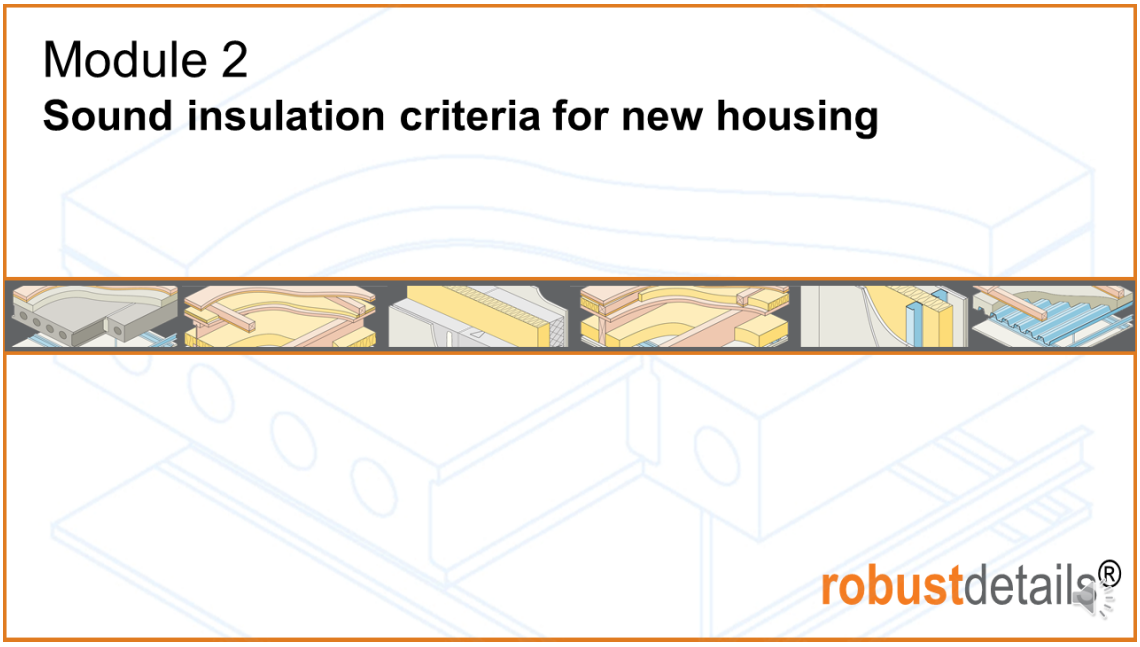
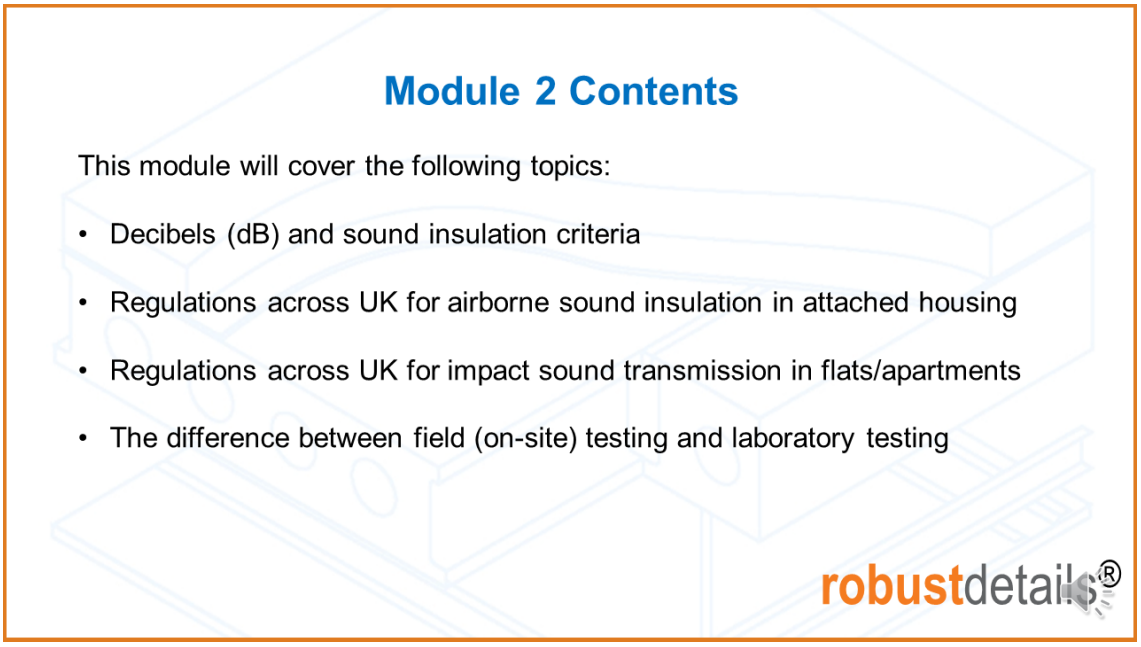
Slide 1



Welcome to Module 2 – Sound insulation criteria for new housing

Additional notes:

Slide 2



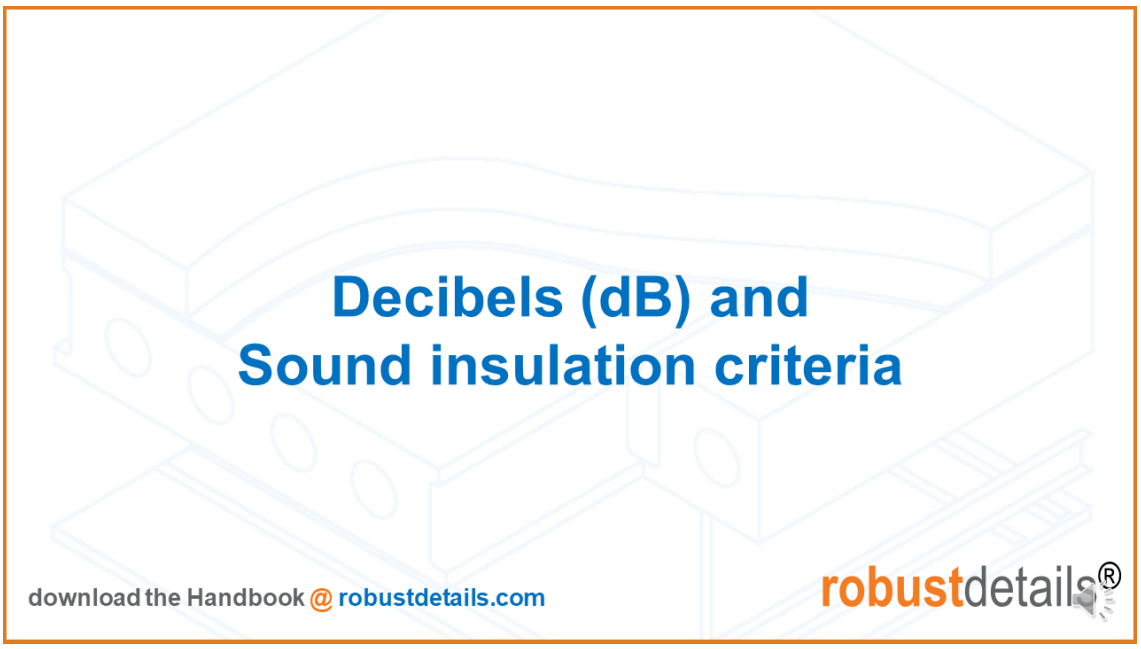
This Module will cover the following topics:

- Decibels (dB) and sound insulation criteria
- Regulations across UK for airborne sound insulation in attached housing
- Regulations across UK for impact sound transmission in flats/apartments
- The difference between field (on-site) testing and laboratory testing

You may notice repetition through this short course, this is to help embed the key information.
Let's move onto our first topic.

Additional notes:

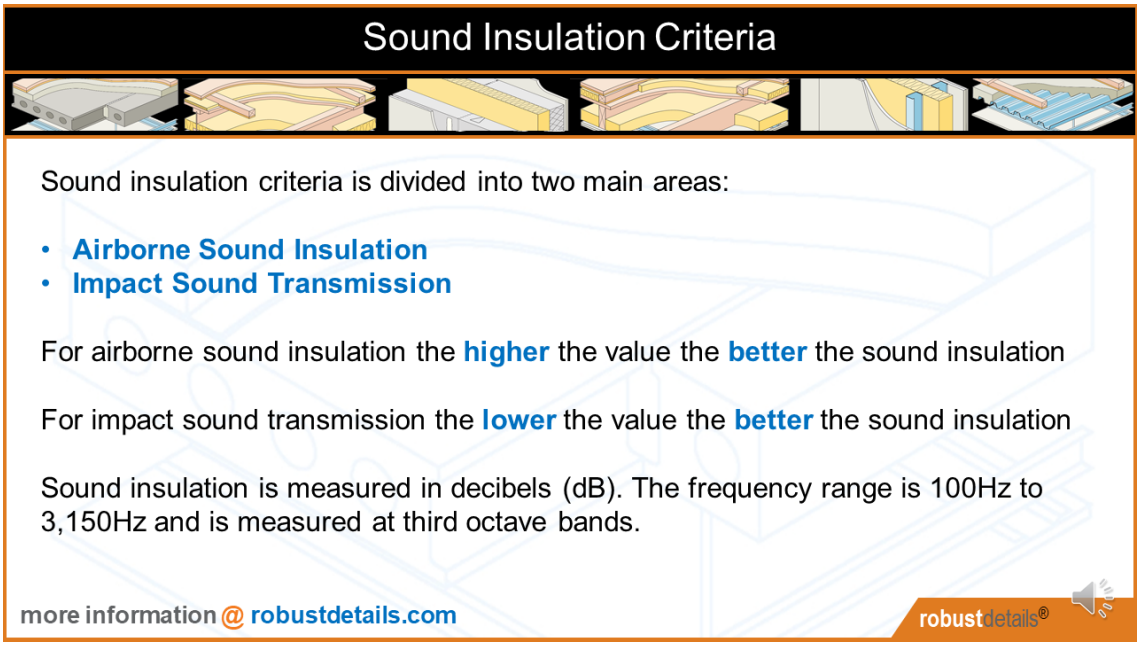
Slide 3



Read slide

Additional notes:

Slide 4



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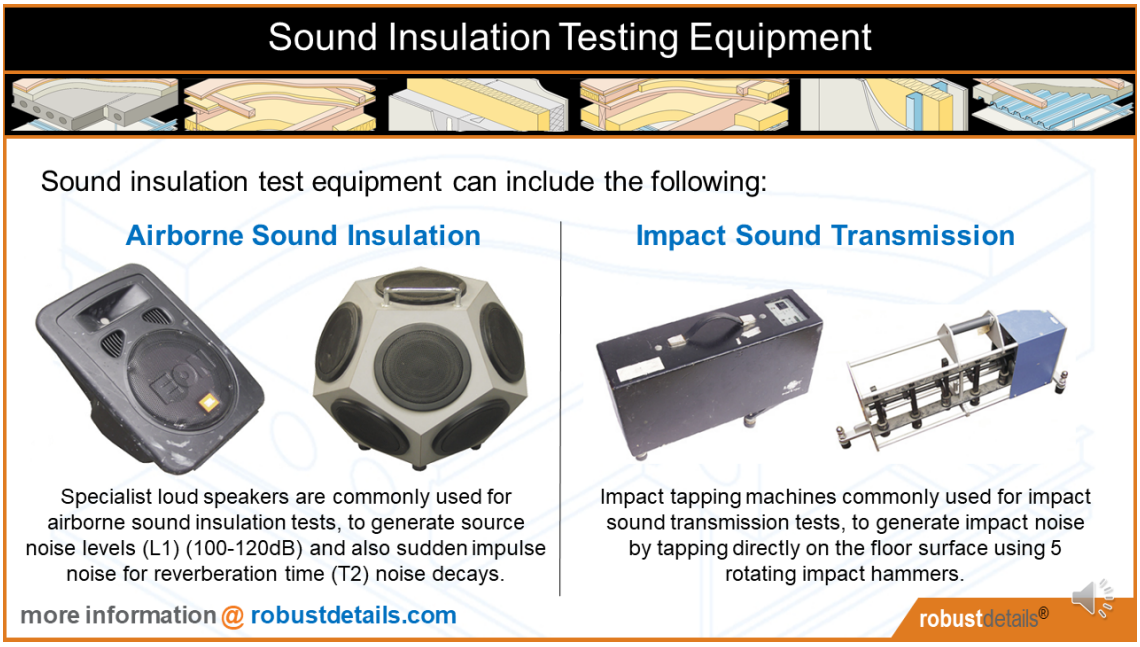
Additional notes:

Slide 5

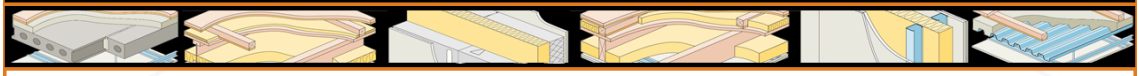


Read slide

Additional notes:

Slide 6

Measuring Airborne Sound Insulation (walls & floors)



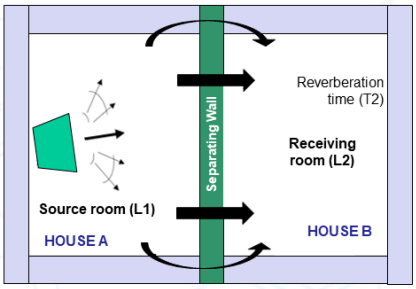
STEP 1: A loudspeaker is switched on in the source room of house A.

STEP 2: The sound pressure level (L1) is measured by microphones in the source room (house A) known as the source level.

STEP 3: The sound pressure level (L2) is measured by microphones in the adjacent receiving room (house B). Sound transmitted from (A).

STEP 4: As the material fabrics or room finishes can affect the amount of sound absorbed (or reflected) in the receiving room, the reverberation time (T2), or echo time (seconds), is measured.

STEP 5: Calculating the airborne sound insulation (known as the standardised level difference), uses all of the above data.



$$D_{nT} = L_1 - L_2 + 10 \log (T_2/0.5)$$

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Read slide

Also note on the diagram the direct and indirect (flanking) transmission pathways shown by the black arrows.

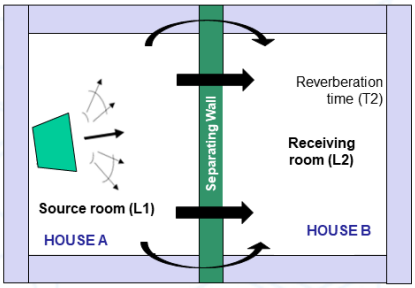
Additional notes:

Slide 7

Measuring Airborne Sound Insulation (walls & floors)

The '**Difference (D)**' = (L1-L2) is the sound insulation the wall or floor is providing. This is then adjusted for the reverberation time T2. These measurements are undertaken across frequencies (100Hz to 3150Hz) and inserted into the equation for **DnT**.

This provides the **standardised airborne level difference** *(normalised [n] to the receiving room reverberation time [T2]).*



$$D_{nT} = L_1 - L_2 + 10 \log (T_2/0.5)$$

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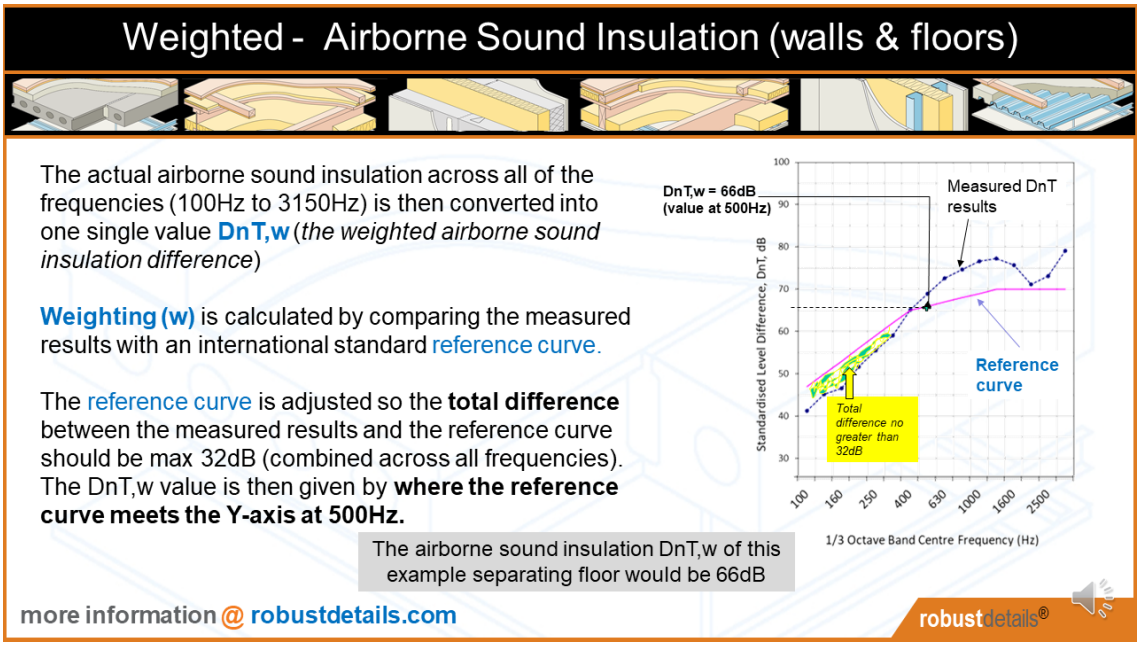
Also note on the diagram the direct and indirect (flanking) transmission pathways shown by the black arrows.

Additional notes:

Slide 8



Read slide

The graph shows – the measured results for each third octave band frequency
The reference curve is shown in purple

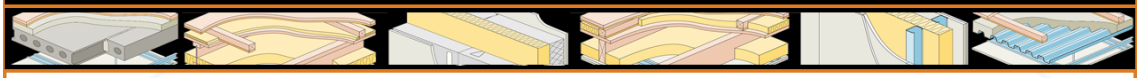
The yellow zone shows how the reference curve has been moved, so the total difference between the two graphs (the yellow zone) is no greater than 32dB.

The sound insulation performance value is then taken from where the ISO reference curve crosses the Y-axis at 500Hz.
In this case the airborne sound insulation of the separating wall was found to be 66dB (DnT,w).

Additional notes:

Slide 9

Measuring Impact Sound Transmission (floors)



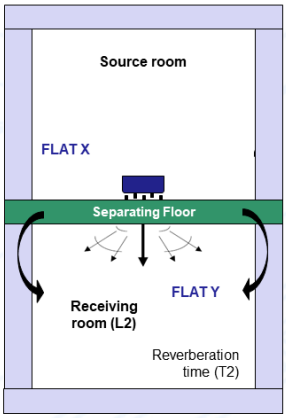
STEP 1: A tapping machine is placed on the upper apartment floor (Flat X) and is switched on to provide a standardised impact sound source.

STEP 2: The impact sound pressure level (L2) is measured by microphones in (Flat Y) below the test separating floor (receiving room).

STEP 3: As the material fabrics or room finishes can affect the amount of sound absorbed (or reflected) in the receiving room, the reverberation time (T2), or echo time (seconds), is measured.

STEP 4: Calculating the impact sound level uses all of the above data.

$$L_{nT} = L_2 - 10 \log (T_2/0.5)$$



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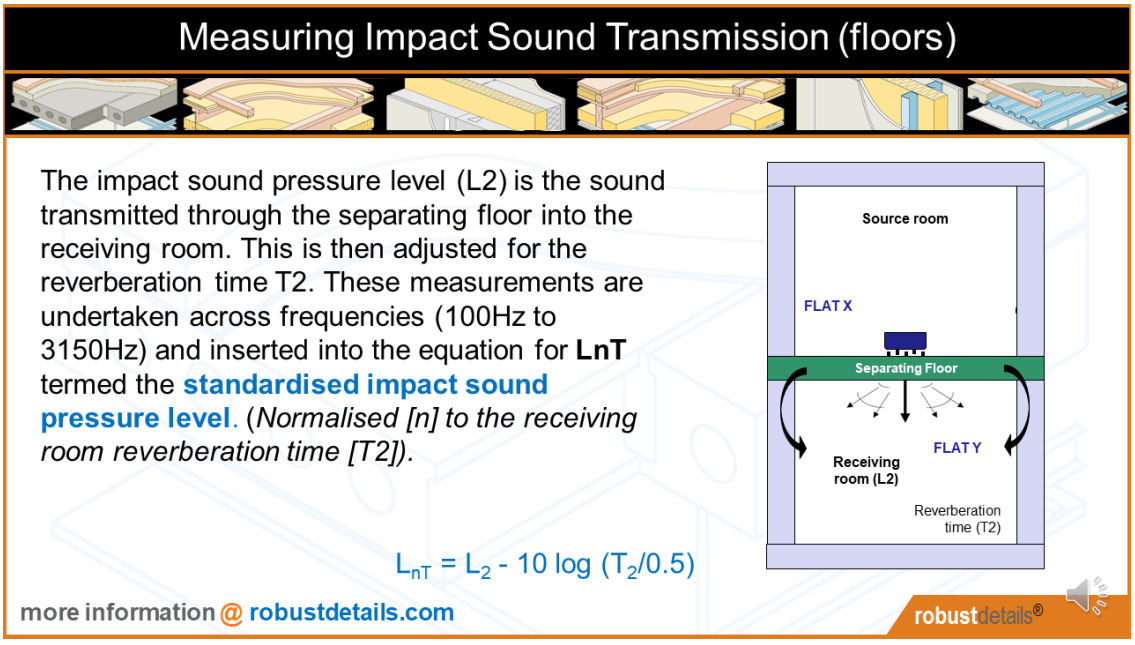
Note how the impact tapping machine drives vibration energy directly into the separating floor and the supporting walls, which then radiates sound into the apartment room below.

Additional notes:

Slide 10



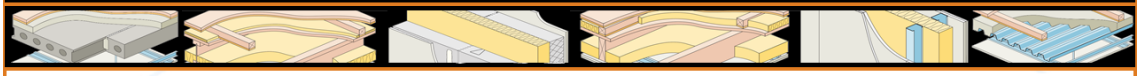
Read slide

Note how the impact tapping machine drives vibration energy directly into the separating floor and the supporting walls, which then radiates sound into the apartment room below.

Additional notes:

Slide 11

Weighted – Impact Sound Transmission (floors)

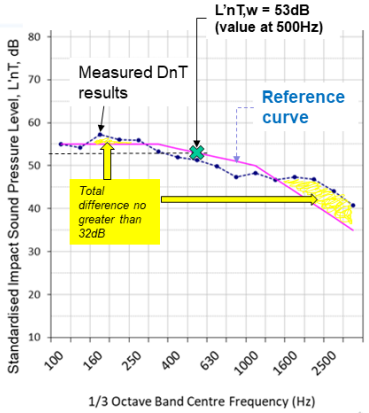


The actual impact sound transmission across all of the frequencies (100Hz to 3150Hz) is then converted into one single value **L'nT,w** (*the weighted impact sound transmission*)

Similar to airborne sound insulation **Weighting (w)** is calculated by comparing the measured results curve with an international standard reference curve.

The **reference curve** is adjusted so the **total difference** between the measured results and the reference curve should be max 32dB (combined across all frequencies). The **L'nT,w** value is then given by where the reference curve meets the Y-axis at 500Hz.

The impact sound transmission L'nT,w of this example separating floor would be 53dB



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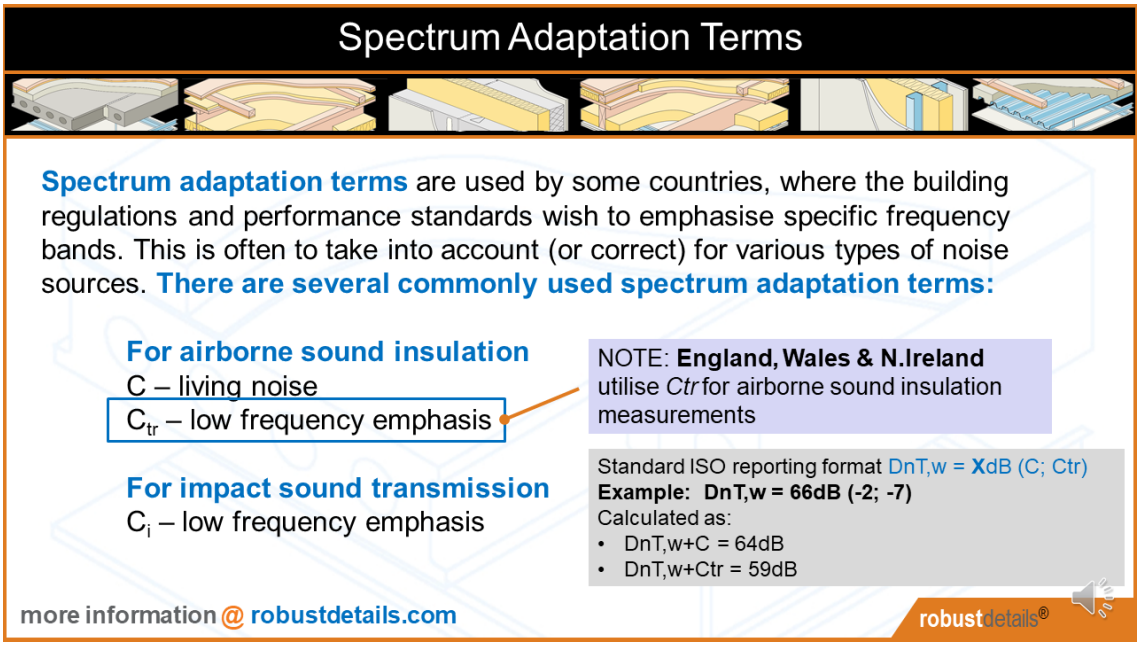
Additional notes:

Slide 12



Read slide

The international standard ISO reporting format is DnT,w = **X**dB (C; Ctr) [in brackets]

So lets take an **Example: where DnT,w = 66dB followed by (-2; -7) [in brackets]**

When calculated this would give the following as:
- DnT,w+C = [66dB minus C correction which is -2] = 64dB
- DnTw+Ctr = [66dB minus Ctr correction which is -7dB) = 59dB

Additional notes:

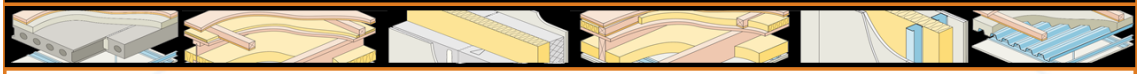
Slide 13

So why is sound insulation important and why reduce sound transmission between attached houses and flats?

Additional notes:

Slide 14

UK – airborne sound insulation standards



- Airborne sound insulation standards for separating walls and floors are often a **minimum performance level**.
- **England, Wales and Northern Ireland** use the same criteria $D_{nT,w}+C_{tr}$ and same levels of a minimum performance standard.
- **Scotland** use $D_{nT,w}$

Airborne Sound Insulation	England Part E	Wales Part E	Northern Ireland Part G	Scotland Section 5
	Min (dB)	Min (dB)	Min (dB)	Min (dB)
Criteria	$D_{nT,w}+C_{tr}$	$D_{nT,w}+C_{tr}$	$D_{nT,w}+C_{tr}$	$D_{nT,w}$
Separating Walls	**45**	**45**	**45**	**56**
Separating Floors	**45**	**45**	**45**	**56**

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The table shows the airborne sound insulation building standards across the four UK nations

Note that Scotland does not include a low frequency correction Ctr and thus uses a **different airborne sound insulation criteria** to England, Wales and Northern Ireland.

When assessing constructions tested in other parts of the UK or overseas with different performance standards to your national standards, please seek expert acoustic advice to ensure the construction adopted will meet your local national sound insulation standards.

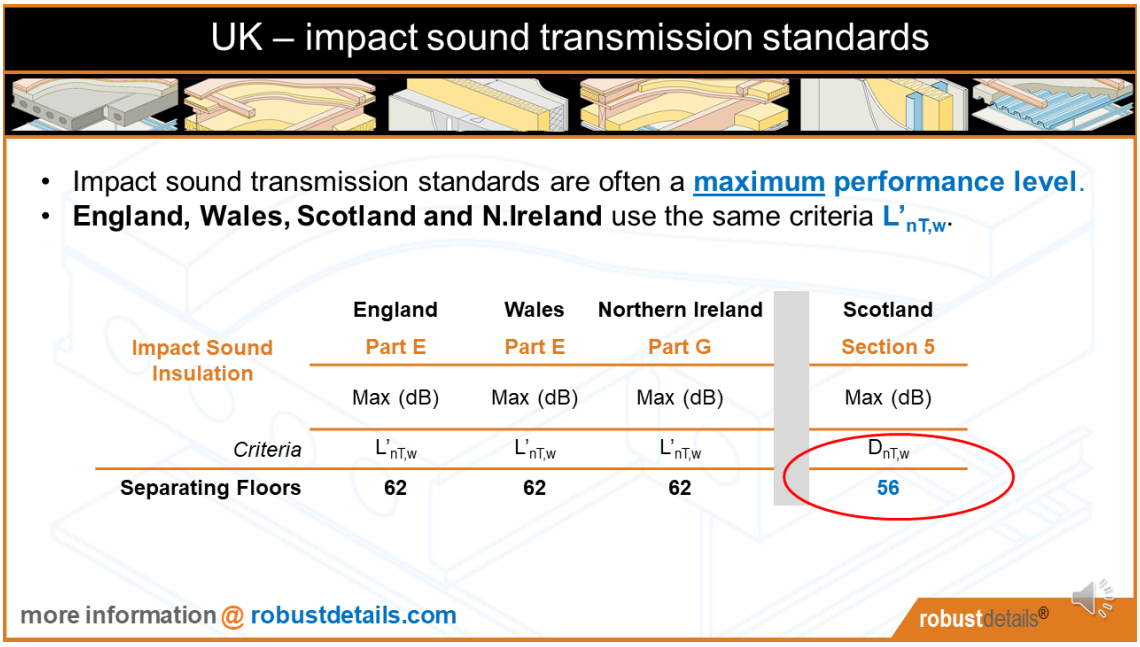
Additional notes:

Slide 15

So why is sound insulation important and why reduce sound transmission between attached houses and flats?

Additional notes:

Slide 16

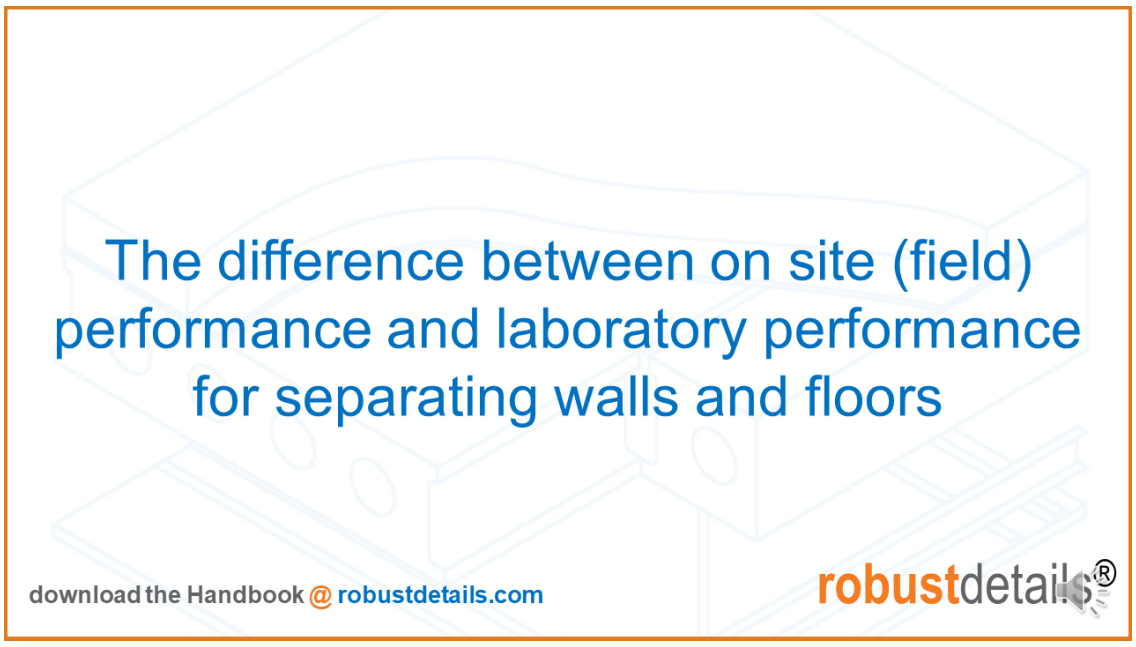


Read slide

Note the lower impact target impact transmission performance for Scotland which is a higher performance standard, as the lower the value for impact the better the performance.

Additional notes:

Slide 17



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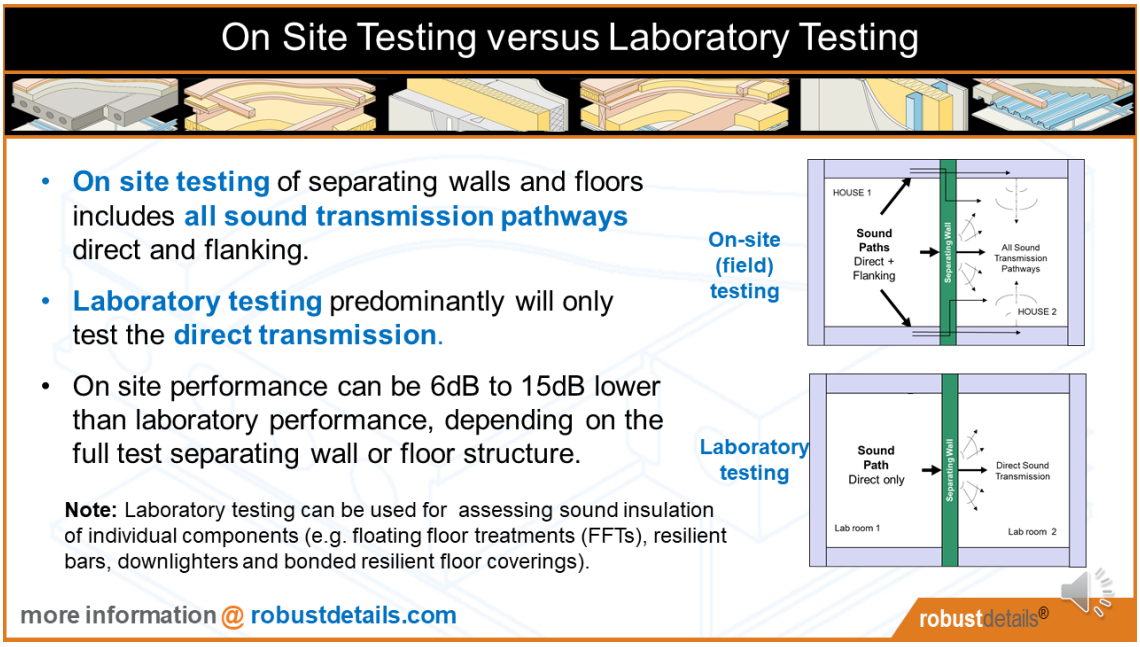
Additional notes:

Slide 18

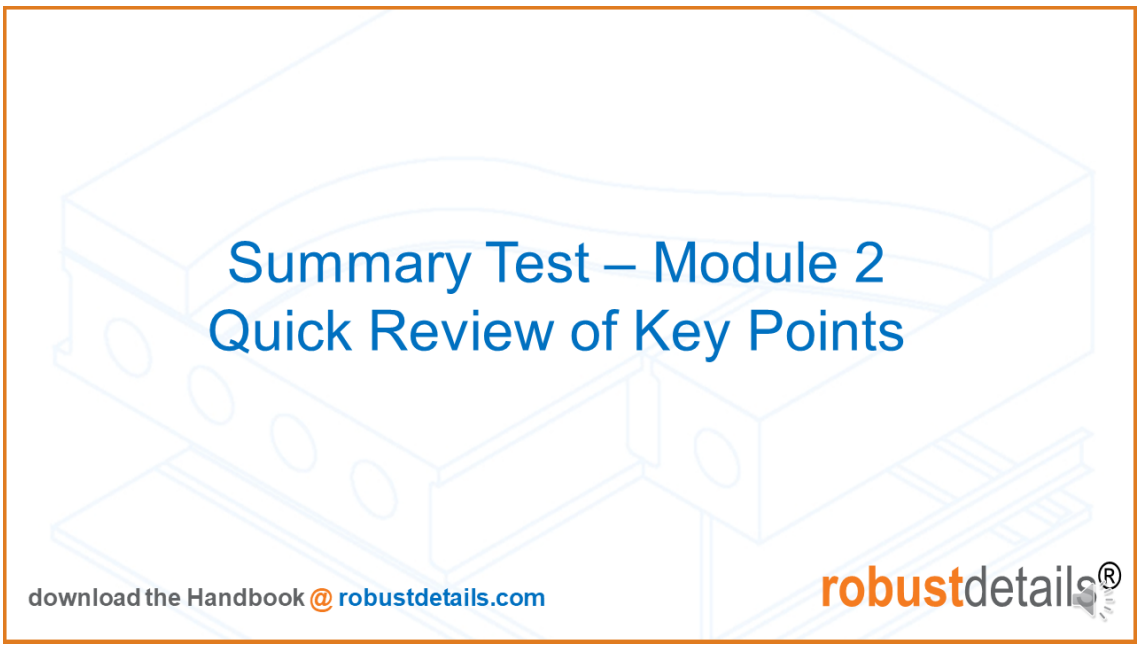


Read slide

Note in the diagrams the number of transmission sound pathways for on-site testing versus laboratory testing
Care should be taken at all times when specifying complete separating wall and floor construction details. Seek specialist advice or refer to the RD Handbook to check the specifications available.

Additional notes:

Slide 19



Now for a quick TEST to recap on Module 2

Additional notes:

Slide 20

Summary Test – Module 2

No.	Question
1	Complete the phrase - *For airborne sound insulation the XX the value the better the sound insulation?*
2	Complete the phrase - *For impact sound transmission the XX the value the better the sound insulation*
3	For airborne sound tests - what is commonly used to create the source noise?
4	For impact sound tests - what is commonly used to create the source noise?
5	Why is the reverberation time measured in the receiving rooms?
6	What is D, L1 and L2 in airborne sound insulation tests?
7	For impact sound transmission do we measure the sound pressure difference between two rooms?
8	What is the maximum difference in dB allowed when using the international references curves?
9	Calculate the **DnT,w+Ctr**, *where the* ***DnT,w=66dB*** *and the* ***C=-5dB*** *and* ***Ctr = -11dB****?*
10	What is the minimum airborne sound insulation performance in dB (and criteria) in England for separating walls?
11	A housebuilder has successfully designed and built an apartment block in England. Could they transfer that design to Scotland automatically?
12	A designer has been told by a specifier that the laboratory test of the separating wall met the attached housing building regulations. Should the designer adopt the design specification into their real site?

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Here are 12 questions – you may wish to PAUSE the recording and test yourself against these questions.

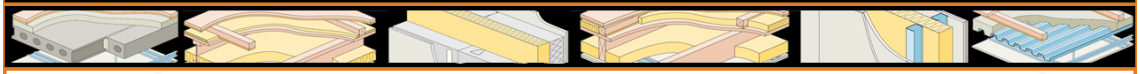
Once you have answered all of them – the next slide provides the answers.
In 10 seconds the slide will change so press pause now if you want to test yourself first.

Thank you for following Module 2.

Additional notes:

Slide 21

Summary Test – Answers



No.	Answer
1	Higher
2	Lower
3	Specialist loudspeakers
4	Tapping machines
5	To take account of acoustic absorption and reflection in the receiving room
6	D is the level difference, L1 is the source room and L2 is the receiving room sound pressure levels
7	No - only the receiving room sound pressure level
8	32 dB
9	55 dB
10	min 45 dB DnT,w+Ctr
11	No. Different criteria are used, specialist acoustic advice should be sought first.
12	No. Laboratory tests of separating wall and floor complete structures do not take into account all transmission pathways. Care should be taken and specialist acoustic advice sought.

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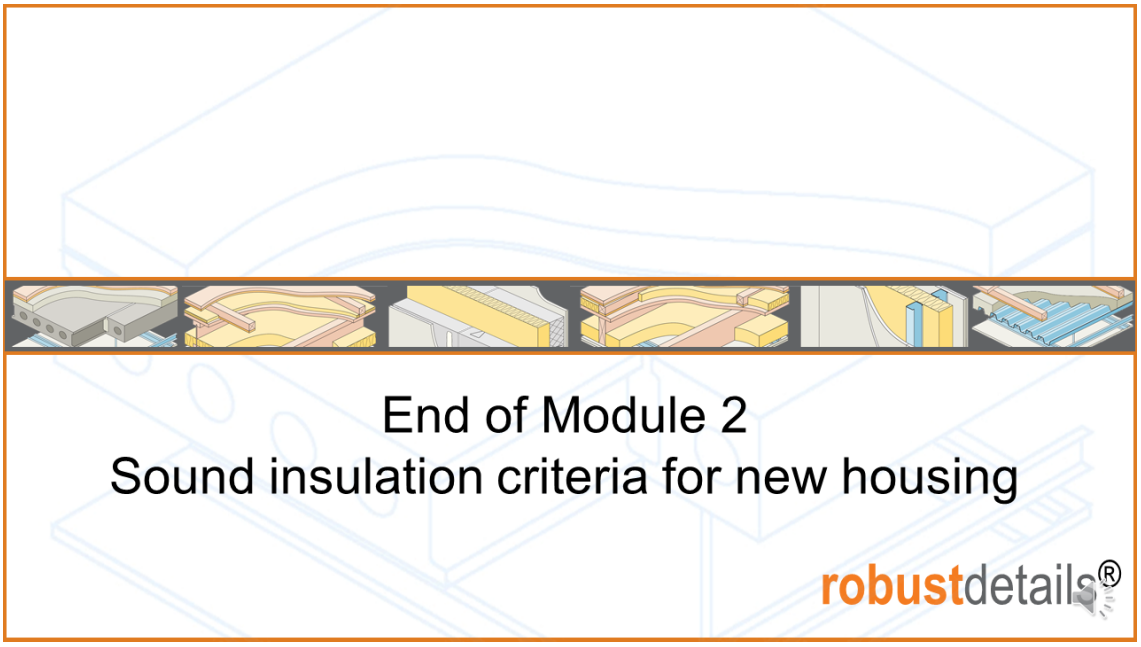
Here are the answer to Module 2's quick test.
How did you do?

Thank you for following Module 2

Additional notes:

Slide 22



This is the end of Module 2 – Sound insulation criteria for new housing

Additional notes:

Slide 12

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Additional notes: