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Case Study
Acoustic Louvre Testing

Testing an Acoustic Louvre

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At Bespoke Acoustic Solutions we realise that the successful implementation of what we design and build is down to the performance of our products and to this end we constantly strive to ensure that the information and data that we publish and use is correct. We do this by regular testing of the products against certified standards and by independent test houses. All our acoustic louvres and panels systems have been recently tested at Salford University to the latest international standards. The following case study will outline the steps involved in producing the sound reduction indices or transmission loss that we publish for our acoustic louvres on our data sheets.

As we highlighted earlier our testing was carried out at the University of Salford- Department of Acoustics. Salford is a leading academic institution with the field of noise control and acoustics.

University of
Salford
MANCHESTER

Measurement of Sound Reduction Index

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The measurement of the sound reduction index of a building element or in our case an Acoustic Louvre requires some very sophisticated electronic devices and a purpose built transmission suite to take the measurements and to house the test sample.

The Airborne Sound Reduction Index is given by the formula:

$$R = L_1 - L_2 + 10 \, \text{Log}(S/A) \text{ dB}$$

Where

L_1 = Sound Pressure Level in the =source room, dB
L_2 = Sound Pressure Level in the receiving room, dB
S = Area of the common partition, m^2
A = Equivalent absorption area (receiving room) , m^2

Measurement of Sound Reduction Index

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At the University of Salford the tests are undertaken within their Transmission Suite. The transmission is suite is basically two large reverberant rooms that are structurally isolated from one another and also from the surrounding building. Another feature of the rooms is that they are built using very thick blockwork and brick. This is to ensure that the noise levels that are measured (L_1-L_2) are attributed to the noise that passes through the partition or element under test and not transmitted by flanking through the walls, ceiling or floor.

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Measurement of Sound Reduction Index

An additional requirement of the rooms is that they are constructed to ensure that a “Diffuse Sound Field” is created within the space. This is achieved by building the walls so that they ae not parallel to one another and by the hanging of diffusers within the space. The non parallel walls and diffusers ensure the sound waves bounce around the room without creating room modes or standing waves and ensuring that equal measurements are achieved anywhere within the space within allowable limits.

Diffusers hanging within the test room

Diffusers hanging within the test room

Omnidirectional Loudspeaker as the sound source

Measurement of Sound Reduction Index

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The measurement process is a two stage measurement – the first involves measuring the equivalent absorption withing the receiving room.

To do this we use a loudspeaker, amplifier and a signal generator. The signal generator is used to produce a signal called white noise – which equally excites the frequencies of interest. The noise is set to a level to enable the reverberation time of he room to be measured. This measurement is taken once the signal noise is turned off, the sound analyser then measures the time taken for each individual frequency band to reduce by 60dB – This is called the Reverberation Time.
In practice due the background levels that are apparent it is seldom possible to measure the decay by 60dB – in this instance the decay to 30 or 40dB may be recorded and then extrapolated.

Omni directional Loudspeaker used to excite the room

From a knowledge of the measured reverberation time and the room volume, the room equivalent absorption can be calculated.

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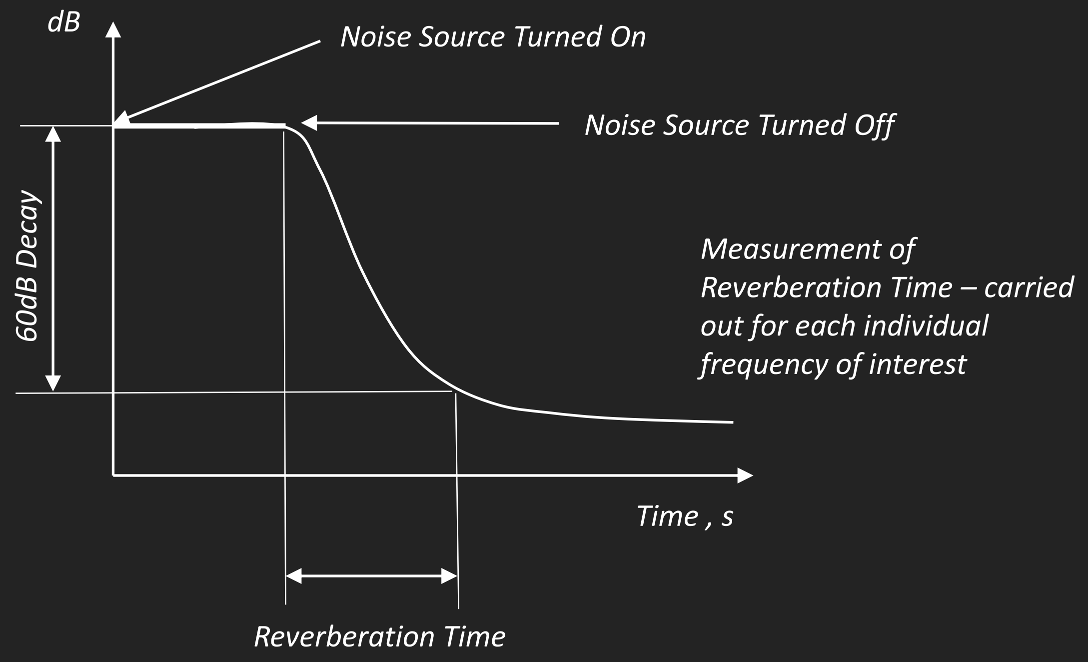

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Measurement of Sound Reduction Index

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The second stage of the process is to measure the level difference between the two test rooms – this will give us the apparent performance of the test specimen.

In this stage of the measurement process, the noise source is turned on within the source room – again using a signal generator to create the white noise and an amplifier and loudspeaker system. The levels in the room are generated above 90dB and are recorder using multiple microphone sources in the source room and the receiving room in real-time. The sound analyser measure the sound pressure levels either side of the test specimen in the frequency bands from 50Hz to 10kHz – the analyser uses a multiplexer or microphone array to measure multiple sources in reals time whilst applying digital filters so that the levels can be split into the frequencies of interest.

Source Room

Receiving Room

Louvre under test

Measurement of Sound Reduction Index

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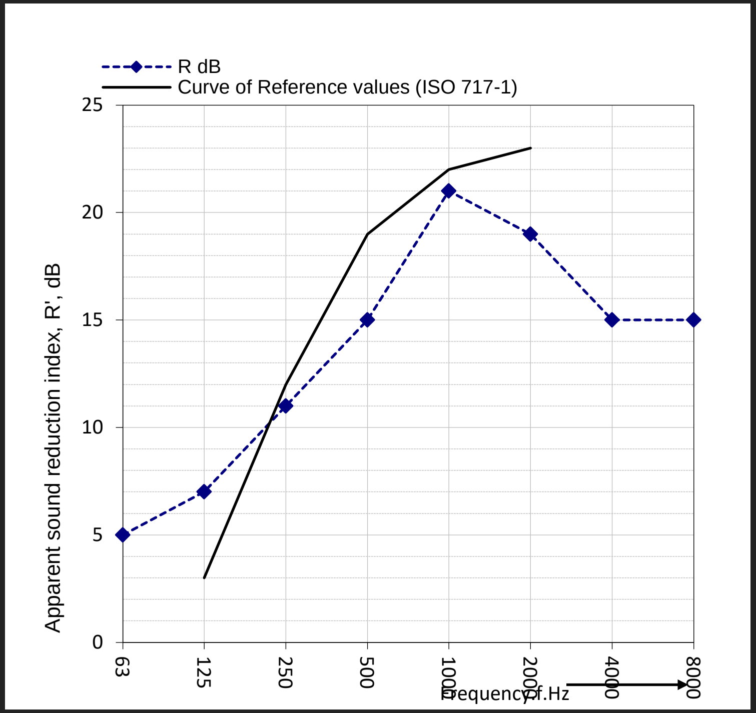
Now all the measurements have been taken and we can then report the test findings and compute the overall Sound Reduction Index.

The international test standard that describes the previous process is BS EN ISO 10140-2 : 2010. The standard states that the results should be reported in the frequency bands 315hz to 500Hz. However as the performance of the Acoustic Louvre and other similar building elements are required at an extended range of frequencies the test report includes additional data to cover the frequencies 63Hz to 8kHz. Additionally the test standard reports the finding in 1/3 octaves, where as for simplicity in acoustic calculations and minimising data these are generally reported as 1/1 octaves.

To derive an overall sound reduction index of the frequencies of interest – the results for each frequency bad are plotted on a graph and then referenced to a standard curve.



Sample Test Data and reference Curve