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Layman’s Guide to Acoustics

Layman's Guide to Acoustics: What you need to know

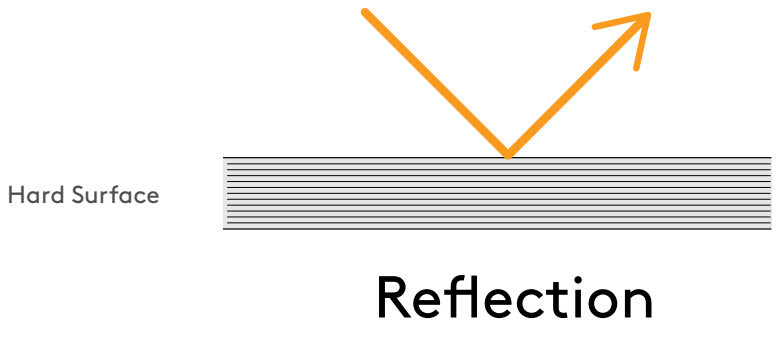
This layman's guide is intended for those of us who are not experts in the science of sound, but want a general understanding of how and why sound is able to be measured and managed in interior spaces

Its Getting Noisier

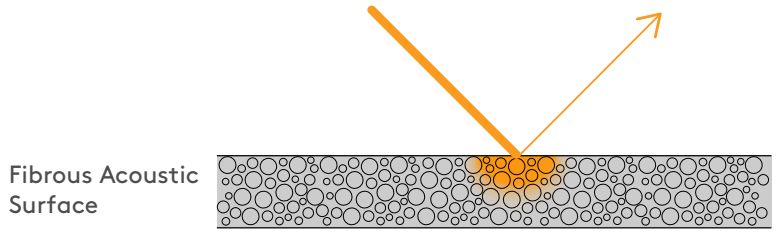
With the advent of open plan offices and open plan living, internal walls are disappearing off design plans. Hard surfaces such as concrete, wood and steel are in vogue for interiors. These trends means that noise issues have come to the fore more than ever before.

How Sound Travels

If we want to improve the acoustics in a room, we need to understand how sound waves travel. Sound waves are energy transfers from cell to cell within almost any medium. Sound is vibration, therefore when a sound strikes a **hard surface** it's **reflected back**. Whereas when sound energy passes over a **fibrous acoustic material the energy is absorbed** and converted to kinetic energy. The more fibrous a material, the better the absorption of sound.



Reflection



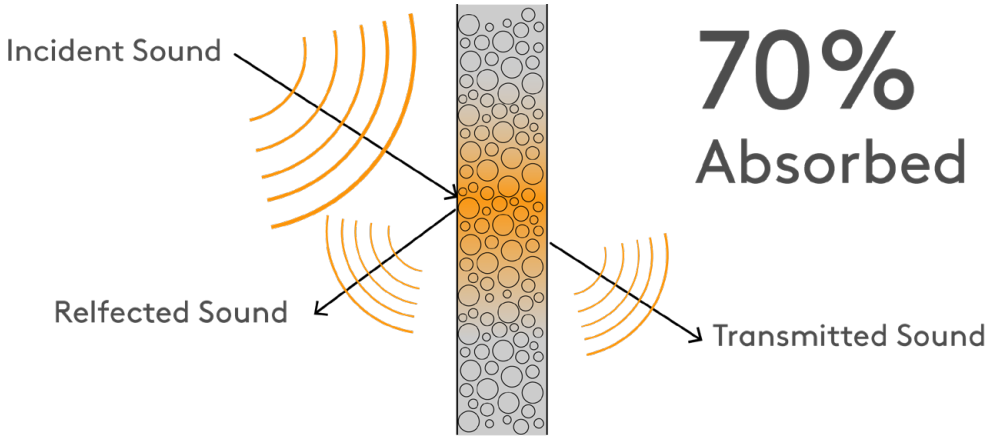
Absorption

NRC:
Absorption vs Reflection

The NRC or Noise Reduction Coefficient of a surface represents its ability to absorb versus reflect sound. The higher the NRC, the better the surface is at soaking up sound. The thickness and density of a product are two factors used in calculating the NRC. This is a universal standard used in the acoustics industry to measure the effectiveness of sound control across frequencies.

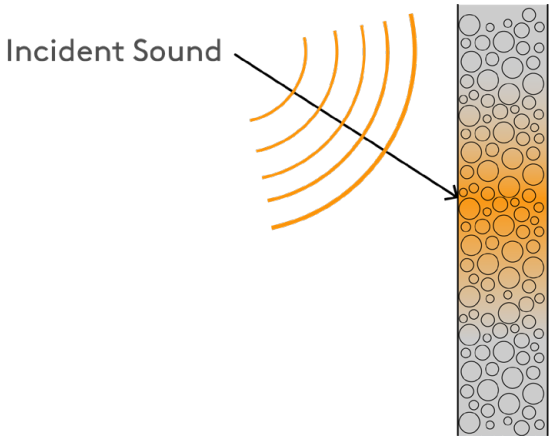
If we rank surfaces from 0 to 1.0 for their ability to absorb sound, a ranking of "0" indicates a complete lack of absorption, while a ranking of "1.0" means perfect absorption. The higher the NRC value, the stronger the sound absorption and the lower the sound reflection in the room.

For example, if a panel has an NRC rating of 0.70, that means that roughly 70% of the sound that hits that fibrous acoustic surface will stop there.



70%
Absorbed

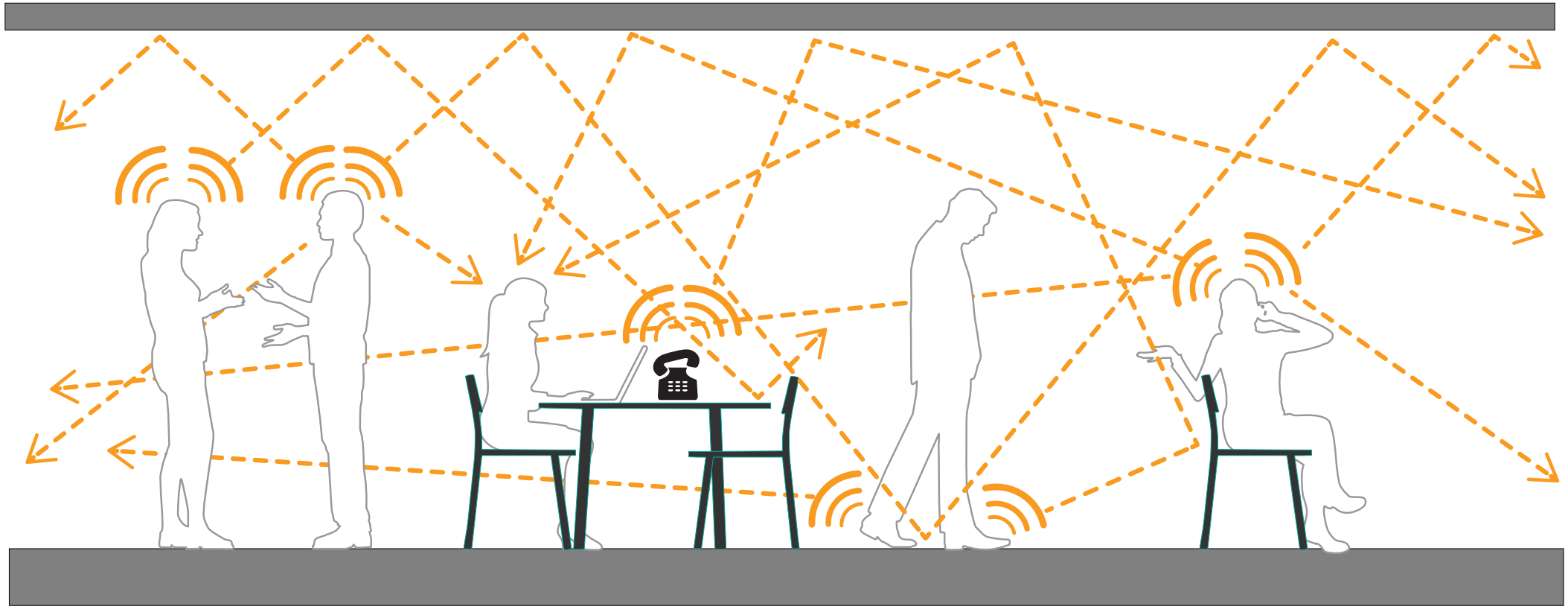
NRC: 0.70



100%
Absorbed

NRC: 1.0

Sabin and NRC



Calculating Sound Quality - Sabin

Sabin is a scientific term for a unit of measurement of sound absorption. It measures how well one square foot of any surface texture in a room is able to absorb sound reflections. This is useful when calculating the sound quality in the room as it provides context.

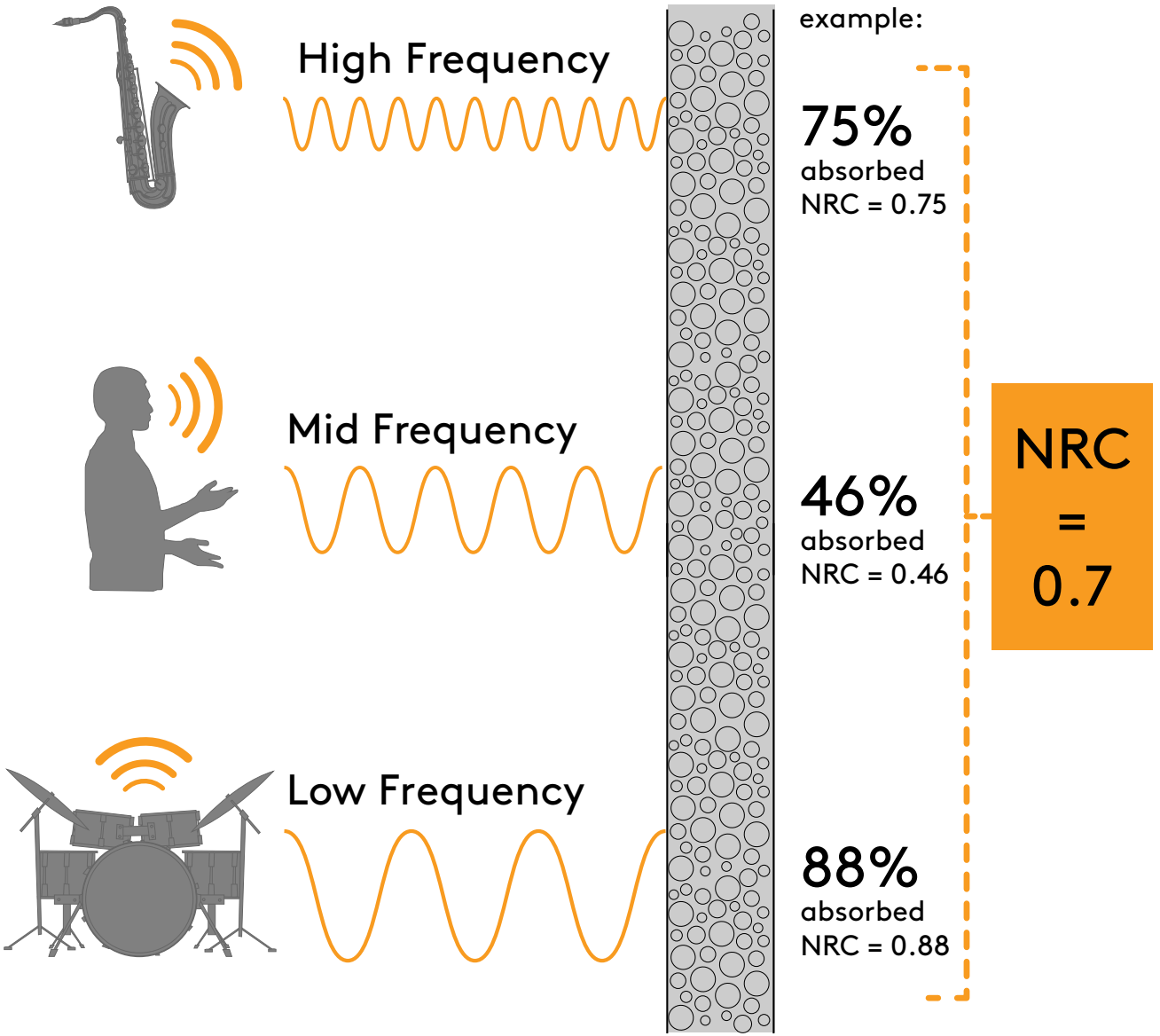
Calculating Sound Absorption - NRC vs Sabin

These two methods of calculating sound absorption are often confused – however a Sabin is calculated by adding the known absorption coefficients in the room. Therefore the higher the NRC values and quantity of material, the higher the Sabin count will be, which will signal slower sound reflections, lower background noise and a more controlled acoustic environment.

But Different Types of Noise Have Different Requirements

The NRC is the average across all frequencies. It's important to note when considering NRC that materials with the same NRCs do not perform identically in the same individual octave bands, as NRCs vary across frequencies. For example a material may be much more effective at reflecting sound in the frequency for speech, but less effective in the frequency for much louder noises.

Normal human conversation is in the mid range of frequencies, and these are the frequency that most work places are concerned with managing. The most distracting sounds in an office environment are generally in this range.Studies show that the impact of excess noise in open plan offices and environments such as restaurants and bars is quite considerable and can lead to increased stress levels which in turn reduce the ability to concentrate. This can even lead to health problems.



How Can we Manage Sound Quality in our Spaces?

A lack of proper absorption coefficients on the existing surfaces in a room can cause unwanted sound reflections. Sometimes the existing Sabin count in a room is just not strong enough to produce enough control over the background noise.

Sound absorption treatments are designed to capture these sound reflections and restore a better level of sound quality. Most advice generally indicates that it's best to consider sound quality at the outset of a building or interior fit out project in order to avoid a space that isn't fit for purpose and requires a costly retrofit later on.

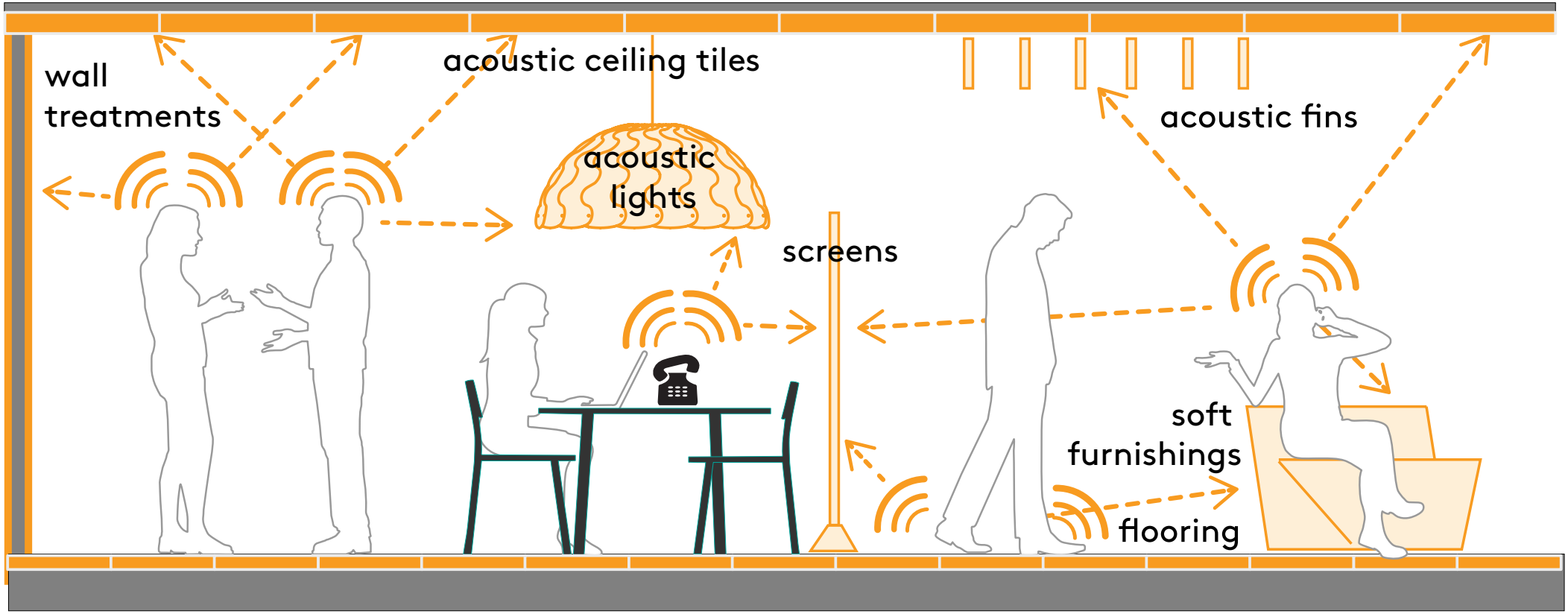
Traditional options have included acoustic ceiling tiles, wall treatments and flooring. These days solutions such as furniture and lighting with acoustic properties offer the option of sound absorption without the need for an expensive fit out or retrofit to a space.

The innovation of using nanofibre in acoustic substrates now also means that they no longer require a level of thickness to achieve a greater NRC and allows more scope for designers.

Considering Acoustics in the Overall Design

The best way to control and minimise unwanted noise sources is via considered design. The acoustic properties of an interior space can significantly reduce sound travel by blocking sound transmission and by absorbing reflected sound. Collaboration and communication can then happen in a more optimal environment. If your goal is to eliminate all noise for complete focus, then you will need to provide an area for isolation – such as a quiet room or an enclosed booth.

Absorptive Acoustic Solutions



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Thank you