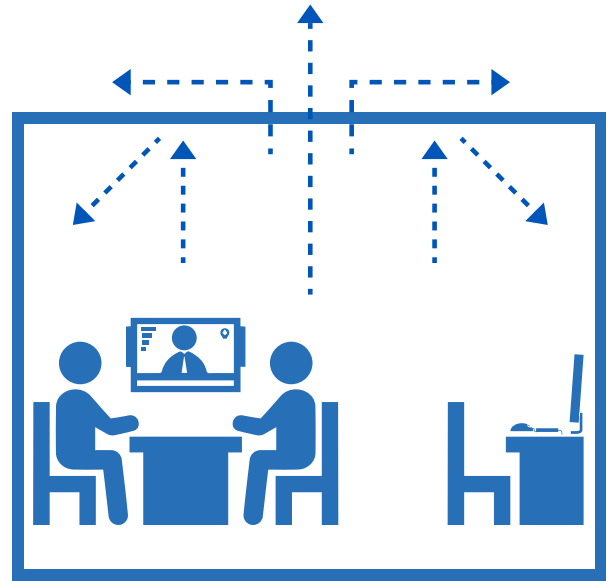


Sound Absorption is a measure of how much sound is absorbed by a surface. The remaining sound is reflected back into the space. In the absence of sound absorbing surfaces a room will become noisy and reverberant, because the sound keeps 'bouncing around'.

This results in a number of undesirable effects - poor clarity of speech and excessive loudness being among the most important. As more sound absorption is introduced to a space, so the noise level will reduce and the sound decay more quickly.

Sound absorption is defined as a coefficient between 0 and 1, where the latter means that all sound is absorbed by the surface – thus none is returned to the room. The sound absorption of a surface is not the same for all types of sound. Porous materials are more efficient at absorbing mid and high pitched (or high frequency) sound than low frequency. Thankfully, we are normally less concerned about these low sounds because speech occupies the mid-high frequency range.



Measuring Sound Absorption

The international standard BS EN ISO 11654:1997 defines sound absorption in varying degrees of detail. The Sound Absorption Coefficient (α_s) and Practical Sound Absorption Coefficient (α_p) both describe how sound is absorbed at different frequencies.

The Sound Absorption Rating (α_w) simplifies this data further by expressing it as a single figure, obtained by comparison with a weighting curve. In addition, the standard defines Sound Absorption Class, which ranks the effectiveness of a surface from A to E, where A is the most sound absorbing.

Initial selection of a sound absorbing product can normally be based on the single figure α_w or the Sound Absorption Class (A-E). Generally, it is only an acoustician that needs more detailed information.

Sound Absorption Explained

SAS products absorb sound using an open-cell porous material faced with a perforated metal sheet. The perforated metal offers no acoustic function and ideally is 'transparent' to the incident sound. This is achieved by forming a large number of holes of appropriately large diameter. Acoustic transparency is limited as the hole diameter approaches the thickness of the metal sheet. Similarly, perforation areas of less than 10% result in the higher frequency sound being reflected as it 'sees' too much metal and not enough hole. There is limited benefit in using perforation areas greater than 25%.

Most ceiling tiles rely entirely on the porous material behind the perforated metal to absorb the sound. Micro-perforated tiles are the exception and can offer sound absorption without a distinct porous backing. In both cases, sound is absorbed because the air particles have to vibrate within a medium that limits this movement. Porous absorbers are most effective when they coincide with air that is vibrating a lot. However, the vibration of air particles is not the same at every frequency or in every location within a room. As such, the effectiveness of a sound absorber is dependent on where it is placed.

Suspended Ceilings

Suspended ceilings are positioned a small distance from a sound reflecting surface which means that the air particle vibration (or particle velocity, as it is called) is easily predicted. It also means that the particle velocity is high, at a given frequency, which results in efficient absorption. This optimum placement is the reason why very thin porous materials can offer significant absorption. Nevertheless, thicker porous linings are generally more effective than thin ones.

Baffles and Rafts

Baffles and rafts are similar in design to wall panels. The main difference is in terms of their position and orientation within the room. Baffles and rafts are placed a long distance from the soffit and as such are 'in the room' and acoustically do not act like one of its surfaces. The particle velocity in these locations is not easily predicted and not likely to exhibit high magnitudes. However, because these elements are 'in the room' they are an acoustic 'object' not merely a surface. The larger contact area and diffractive effects at the edges result in sound absorption that is greater than the same single-sided area placed parallel and close to a soffit. It is an oversimplification to assume that it will exhibit twice the sound absorption in line with a doubling of 'visible' area. This argument ignores the importance of where a raft or baffle is placed within a room.

Wall Panels

Wall panels are similar to suspended ceilings in terms of being close to a sound reflecting surface. The sound absorption is often poorer at low frequencies because the gap between the panel and wall is less than a typical suspended ceiling void.