SOUND
ABSORPTION

THE KNOWLEDGE
ACOUSTICS
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ACOUSTICS

Absorption

We've probably all been in a busy modern restaurant which has lots of hard decorative and functional surfaces where it has been difficult to conduct a comfortable conversation across the dining table.

This is because the sound in the room is repeatedly bouncing off the hard surfaces of the floors, walls, ceilings, windows and even the tables. In this situation it is the reverberation time which is causing the problem. The reverberation time of a room is defined as the time it takes for a sound to decay by 60dB. So, if a sound in a room takes 10 seconds to decay from 100dB to 40dB, the reverberation time is 10 seconds.

The "optimum" reverberation time very much depends on the main purpose of the space. Typical spaces and ideal reverberation times are listed below:

Space	Reverberation time
Classrooms	< 1 second
Lecture theatres	1 second
Assembly halls	1.5 to 2.5 seconds
Music venues	3.5 seconds

Sound absorption is the loss of sound energy when the sound wave meets an absorbent material such as a ceiling, a wall, or a floor. So, unlike hard surfaces where the sound is reflected directly back and bounced around the room, some of the sound is absorbed and not reflected back into the space.

Soft absorbent surfaces, as opposed to hard reflective surfaces can therefore be used to control this reverberation time. There are different types of sound absorbers, common ones on surfaces tend to be fibrous materials and open cell materials such as foams.

Fibrous materials absorb the sound energy as the sound wave forces the fibres to bend and this consequently reduces the sound energy.

An open cell foam absorbs the sound energy by forcing it through narrow passages which again results in sound energy loss.

Usually, the thicker a material the better it will be able to absorb sound energy. Thickness can be added by introducing an air space behind the material, so behind a wall or ceiling panel. This forces the sound energy through the absorbent panel and a percentage of the remaining sound energy is reflected into the underside of the panel forcing it to make a second journey through the absorber before being reflected back into the room.

In flooring, carpets due to their fibrous nature are good sound absorbers and the thicker the pile usually the better the sound absorption properties.

BS EN ISO 3382 is the standard defining measurement of room acoustic parameters and it is split into 3 parts. Part one defines performance spaces, part 2 defines reverberation times in ordinary rooms and part 3 defines open plan offices.

In the UK, Building Bulletin 93: acoustic design of schools – performance standards, sets out the minimum requirements for the acoustics of school buildings. It defines the indoor ambient noise levels as well as the reverberation times needed for clear communication of speech between teacher and student, clear communication between students, learning and study activities, and music teaching and performance.