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Specifying acoustic absorbers where they will be installed against a wall

This advice note will help specifiers understand the performance (including fire) of wall mounted acoustic absorbers, acoustics and room acoustics, reverberation and absorption, conformity marking and importantly their installation.

Performance
Absorbers are considered materials covered within BS EN 13964 Suspended Ceilings: Test Requirements and Methods, which is now a UK designated standard requiring conformity marking when put on the market in the UK. The Declaration of Performance will include expected performance for reaction to fire and acoustic absorption.

Fire performance - 'reaction to fire'
To be valid, reaction to fire must be carried out by a UKAS* or Approved Body* test laboratory that is authorised to conduct and issue test reports in accordance with the specific test Standards.

Reaction to fire is the measurement of a materials contribution to the development and spread of fire, generation of smoke and the production of flaming droplets. All are major factors in the rate of development of a fire and thereby the risk to people and property. With the exception of A1 non-combustible, ceiling products have a classification with three references e.g. "A2-s1, d0" (see Fig 1)

Reaction to fire is classified under BS EN 13501 -1. Products are tested using a number standards dependent on their predicted performance.

FIG 1 explains the classification system under BS EN 13501-1

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The required "Reaction to Fire" classifications for materials used in commercial buildings are shown in Approved Document B
Reaction to Fire is a material test and as such the tests are carried out under very strict criteria.

Acoustics (see FIS Guide to Office Acoustics)

Room Acoustics
To ensure that the room acoustics are fit for purpose the level of reverberation within the room should be controlled.

Reverberation
Acoustic problems and disturbance in a room are often derived from long reverberation times, which give a room an echoey feel.

The acoustic quality of a room can be expressed by measuring the reverberation time (RT) - the length of time it takes for reverberation to die down. If a room has a long reverberation time, one spoken word does not have time to die out before the next reaches the listener. With this overlapping of sound, speech intelligibility is poor. Generally, the shorter the reverberation time the better the speech intelligibility.

The optimum reverberation time for a room or space is dependent on its intended use be it office, conference room, classroom, cafeteria, cinema or library.

Measured in seconds, reverberation time (RT) is defined as the time taken for a generated sound to decay by 60dB once the sound source has been stopped.

Measurement of the rooms RT and any subsequent calculations will be dependent on a number of the room's physical attributes. The dimensions and shape of the room, the construction and materials used for the interior surfaces and the type and position of any other materials or objects used in the room. Surface materials and objects with good, proven levels of sound absorption will reduce reverberation time.

As well as providing the right balance between reflection and absorption, the selection quantity and positioning of sound absorbing materials are key factors in achieving the correct reverberation time for the rooms intended use. Acoustic products in the upper parts of the walls provide a more consistent level of absorption/reflection as they are free from obstructions such as desks, chairs, furniture, etc.

Sound absorption
A products sound absorbing properties are described in sound absorption classes (A-E), Class A being the highest level of sound absorption.

Materials are tested for their ability to absorb sound by being placed in a reverberation chamber and tested in accordance with EN ISO 354. The test is carried out over 18 separate frequencies from 100 Hz to 5000 Hz and the results reported individually as sound absorption coefficients (αs) between 0.00 (total reflection) and 1.00 (total absorption).

NOTE: Whilst being tested to the same ISO standard, acoustic absorbers/rafts/islands, wall absorbers, etc. are tested using a different layouts, reflecting the way they are each normally used in a room setting

Class	A	B	C	D	E	Not Classified
α_w value	0.90, 0.95, 1.00	0.80,0.85	0.60, 0.65, 0.70, 0.75	0.30, 0.35, 0.40, 0.45, 0.50, 0.55	0.15, 0.20, 0.25	0.00, 0.05, 0.10

For products that are **continuous**, i.e. traditional wall panelling without gaps between individual panels, the most appropriate method of assessing and quantifying sound absorption is to use the traditional sound absorption coefficient and alphabetical classes of sound absorption methodology in accordance with ISO 354. Sound absorption data αp, αw and absorption class are calculated in accordance with ISO 11654.

For **discontinuous** solutions, the equivalent sound absorption area methodology should be used, meaning that the sound absorption properties of discontinuous absorbers should be quantified by the equivalent sound absorption area Aeq expressed in m^2/item in accordance with ISO 354.

Acoustic absorbers, also known as islands baffles, rafts, discontinuous wall linings and discontinuous ceilings (also known as discrete objects) are tested individually using a number of units at a time to provide a more accurate level of performance. An important inclusion on the test certificate is the "distance between the exposed surface of the test object and the nearest room surface". As this distance can make a significant impact on the absorber's performance most manufacturer test a range of distances.

The test results are reported for each frequency but unlike a continuous ceiling they are reported as an "equivalent area per object m2" (A).

The "equivalent sound absorption area" (A) is the amount of a chosen product or object that would be required to equal 1 m2 of a notional material (or open window) that has a sound absorption coefficient (α) of 1.00 (100 % absorption) at all frequencies.

NOTE: As there is no single weighted figure for these results, the best comparison is to calculate the reverberation time for each room or consult an acoustician who will compare products and calculate the quantity you require to achieve the optimum reverberation time in each room. They can also advise on the optimum positioning of the absorbers.

Intelligibility
It is important that speech can be understood, so in addition to working towards achieving a reverberation time some additional acoustic engineering may be required by adding additional reflective and absorbent surfaces in strategic places.

Conformity marks
UKCA Mark (for products placed on the market in England wales and Scotland).

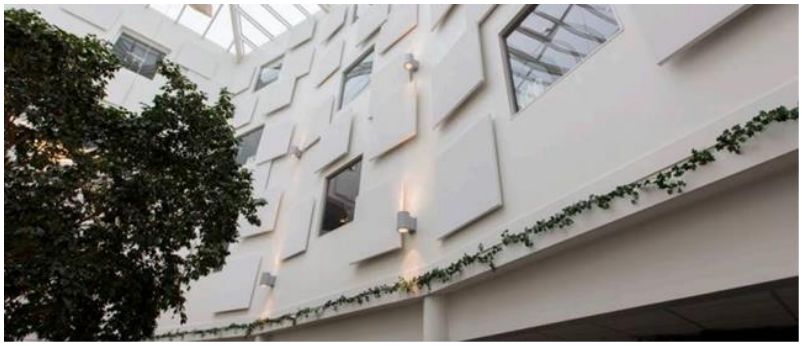
The UK has adopted current (2021) Harmonised European Norms as designated standards requiring products placed on the market in England Scotland and Wales to have a declaration of performance produced by an approved body in the UK and to affix a UKCA mark and is applicable to ceilings and baffles hung from the ceiling.

Absorbers
Absorbers are installed to reduce reverberation as a result of hard surfaces in a space. They are designed to be suspended from the soffit or fixed to the walls and can be installed during construction / refurbishment or retrospectively.

Where a reverberation problem already exists in a room, absorbers can help provide an easy solution. An acoustician should be consulted to identify the problem and advise the correct number of absorbers required and where to place them for the best performance.

Acoustic absorbers

Continuous *wall* panels



Discontinuous absorbers or *wall* islands.

Formed from single or multiple elements, acoustic absorbers can be suspended from the soffit/ ceiling, fixed to walls/ partitions or be supplied as a standalone screen. To achieve the best acoustic performance, they should be installed as per the test report with an appropriate gap/void depth behind the product if required. See Installation depth.

Where suspended from an existing soffit, ensure that the correct top fixings are used and if suspended below an existing suspended ceiling ensure that the original ceiling and existing top fixing can carry both loads

Installation depth

When selecting a ceiling consider the void depth requirements to meet the acoustic performance and the height required to install and remove ceiling tiles, especially where services run through the void and access into the void is required.

Where the ceiling or acoustic absorber is providing fire, acoustic or other proven levels of performance the installation depth should as per the relevant test certificate/report. Ignoring the test installation depth without

consulting the manufacturer or a consultant may cause a significant reduction in acoustic performance and /or a significant reduction in the required level of fire resistance, thereby posing a serious risk to life and property.

NOTE: Void depth is critical as the space between the back of the product and the soffit /wall will impact performance.

NOTE: The void depth can be found in the test report provided by the manufacturers.

*EN tests to be carried out by a Notified Body