

PERFORMANCE CEILINGS  
More scope for innovation



EDUCATION



# NEW SOLUTIONS FOR EDUCATIONAL BUILDINGS



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AMF product literature has been redesigned.

The Education brochure is Part 1 of the application series.

Programmes 1 to 6 provide detailed information on product performance.

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## Acoustics in classrooms and lecture theatres

Acoustics in classrooms are a subject of considerable interest to both education and construction sectors.

Poor acoustic conditions are often found in these rooms. Designers and acousticians realise that rules of acoustic design - which have been known for many years - are being ignored. Teachers are frustrated that education authorities and contractors have the wrong priorities.

Exposure to noise has an immediate effect on the mental state of both pupils and teachers. Consequences include poor speech comprehension, reduced attention and concentration and greater psychological instability. Short term memory suffers and noise also promotes aggressive behaviour.

The main requirements for classrooms and lecture theatres are:

- Very good speech comprehension
- Correct transmission of speech
- Restricted noise from outside the building and from adjacent spaces
- Good acoustic conditions generally within the room itself

A major survey has been carried out in both occupied and unoccupied classrooms. These areas were further differentiated between those with and without any acoustic treatment. Measured speech comprehension was significantly worse in the untreated rooms, with several black spots found. Problems were increased in rooms occupied by children due to the higher noise levels caused by general activity within the rooms.

Results of a teachers' questionnaire revealed interesting facts:

Teachers who consider their classrooms to be noisy tend to

- suffer from regular headaches
- connect sore throats with their work
- are sick more often with throat problems

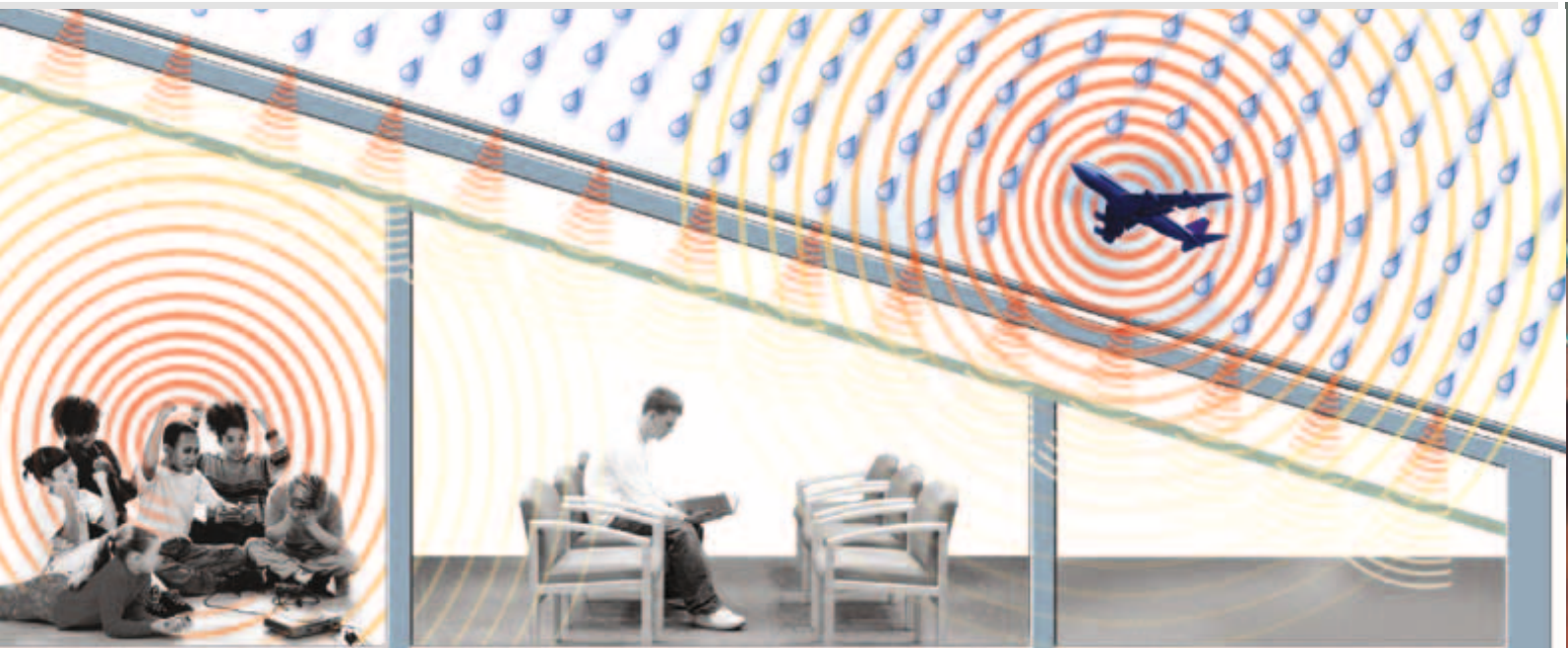
Teachers who consider their classrooms to be too reverberant tend to

- believe that acoustics influence their performance
- are convinced that pupils' performance and behaviour are influenced by the acoustics
- are absent through illness more often than other colleagues

This survey demonstrates that, when designing class rooms, acoustic considerations are important.



# COMPLEX ACOUSTICS IN SCHOOLS





## Reflection

An acoustic source produces acoustic waves, similar to the effect of a stone being dropped in a smooth pool of water. The waves spread evenly from the source and reach everywhere in the space. This acoustic signal provides information when it arrives at the listener. Sound waves which are blurred or absorbed by objects within the space have a major impact on intelligibility.

The human evolution of the ear and the brain - the users of sound information - has become accustomed to reflections and echoes from acoustic signals.

The crucial aspect is the length of delay in reflected sound reaching the listener's ear. If the time difference between the original sound and reflected sound is too long, the brain cannot establish the relationship between the sounds but treats them as separate signals. An example of this is the echo from a shout in the mountains.

If the time difference between the two sound elements is too short, this results in a space with "dead" acoustics, where reflected sounds are missed by the brain.

The result is a poor acoustical environment, disorientation and reduced speech comprehension.

## Sound absorption

Characteristics of reflection and absorption are measured by the degree of sound absorption in a space. Every surface in a room has a sound absorption factor that affects the room acoustics. The sum of these factors produces an acoustic stored mental picture of the particular space. Take for example a church. Our mind visualises a number of impressions - resonating sounds, classical music, a high volume and long reverberation times. This is created by the geometry of the room and reflective materials such as marble floors and stone walls. By contrast a domestic living room creates the impression of warmth and peace. A small space and multiple use of absorbent materials such as carpets and soft furnishings create this mental image.



# SOUND ABSORPTION



## Reverberation time

Speech intelligibility depends on two factors: the ambient noise within the room and the reverberation time of the space. The latter is the time, in seconds, required for reverberant sound in an enclosed space to reduce to a millionth (i.e. to drop by 60 dB) of its original energy level after the source of the sound is stopped. Reverberation times normally vary across the spectrum.

Ultimately the reverberation time is created by the size and number of reflections and absorbing materials within a given space. The planned application of the room defines within certain tolerances what reverberation times should be achieved. Recommendations for such reverberation times differ from country to country, as can be seen below:

### Ideal reverberation times

For unoccupied classrooms (volume less than 250 m<sup>3</sup>)

USA	0.4 – 0.6 s
UK	0.5 – 0.8 s
D	0.5 – 0.6 s
I	0.6 – 0.8 s
F	0.4 – 0.8 s
CH	0.5 – 0.7 s
S	0.5 – 0.6 s

Maximum for frequency range 250 - 4000 Hz.

For 125 Hz a 20 % higher value is allowed

### Ideal reverberation times

For unoccupied lecture theatres (volume up to 250 m<sup>3</sup>)

USA	1.0 – 1.5 s
I	0.6 – 0.8 s
UK	0.8 – 1.4 s
CH	0.6 – 1.0 s
F	0.6 – 1.2 s

For the **aurally handicapped** there are naturally more severe requirements

UK	0.3 – 0.6 s
CH	0.3 – 0.4 s

The stated figures refer to **mid-range sound\***

\*Mid-range = median of octave bands 500 - 1000 Hz



## Reverberation time

To achieve a good acoustic environment the whole room needs to have the correct reverberation time. Particular areas such as classrooms have individual requirements and cannot be governed by universal guidelines.

Lecture rooms should be designed to ensure that the speaker's voice is clearly projected to the audience. Immediate reflection of sound waves carries the voice into the room. Unwanted noise, however, must be absorbed. The correct application of reflection and absorbing fields in the ceiling can create this balance.

To create a uniform ceiling that includes both absorbent and reflective tiles, AMF offers products that embrace these criteria. Those are **THERMATEX Fine Stratos** and **Laguna** in plain and micro-perforated versions and **THERMATEX Acoustic**.

### Visual contact - speaker to listener

A floor plan and the location of the audience must be designed in such a way as to maximise the link between speakers and listeners. For the aurally handicapped good lighting is essential to aid lip-reading.



# SOUND INSULATION



## Sound insulation

Acoustic considerations for schools are often only concerned with sound absorption or reflection within classrooms. However all rooms in schools are affected by external sound sources. These can be a variety of influences including noise from adjacent music rooms or sports halls; impact and airborne sound from rooms or corridors above; mechanical equipment within the building; and road or aircraft noise from outside.

Speech Intelligibility is also governed by such intrusive noise so these effects have a substantial influence on the efficacy of a room and require detailed consideration.

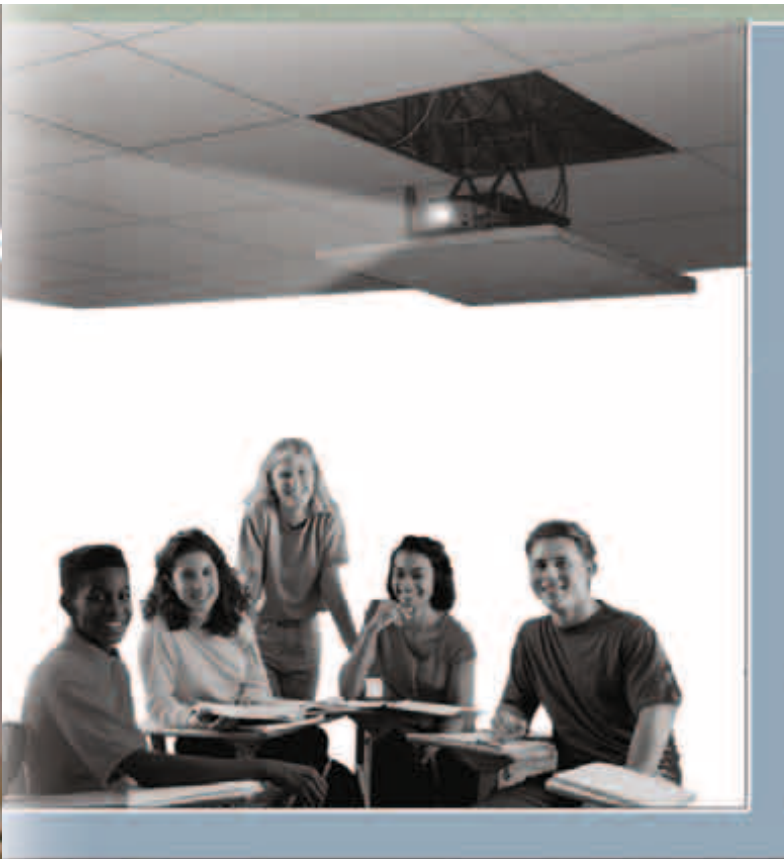
The process of isolating a room from external sound sources is called sound insulation. This reduces airborne and impact noise from the external sources and maintains a good acoustic ambience within the room.

Analysis of individual construction materials that applies to sound absorption is much less relevant for sound insulation. The latter requires the space as a whole to be considered, as a single weak element will create a negative effect. Sound leakage through a solitary point will spoil the sound insulation for the whole room. As a result national requirements such as DIN 4109 and British Building Regulations Approved Document E pay greater attention to sound attenuation factors to achieve optimal acoustic solutions.

Sound attenuation can be illustrated by the example of a water dam. To raise the water in the dam to a higher level, the entire dam wall must be increased in height. If however there is a small leak in the dam wall, no amount of new construction will let the water level rise.

For high sound insulation requirements, such as in schools, the appropriate selections and adequate installation of building materials and systems is crucial.





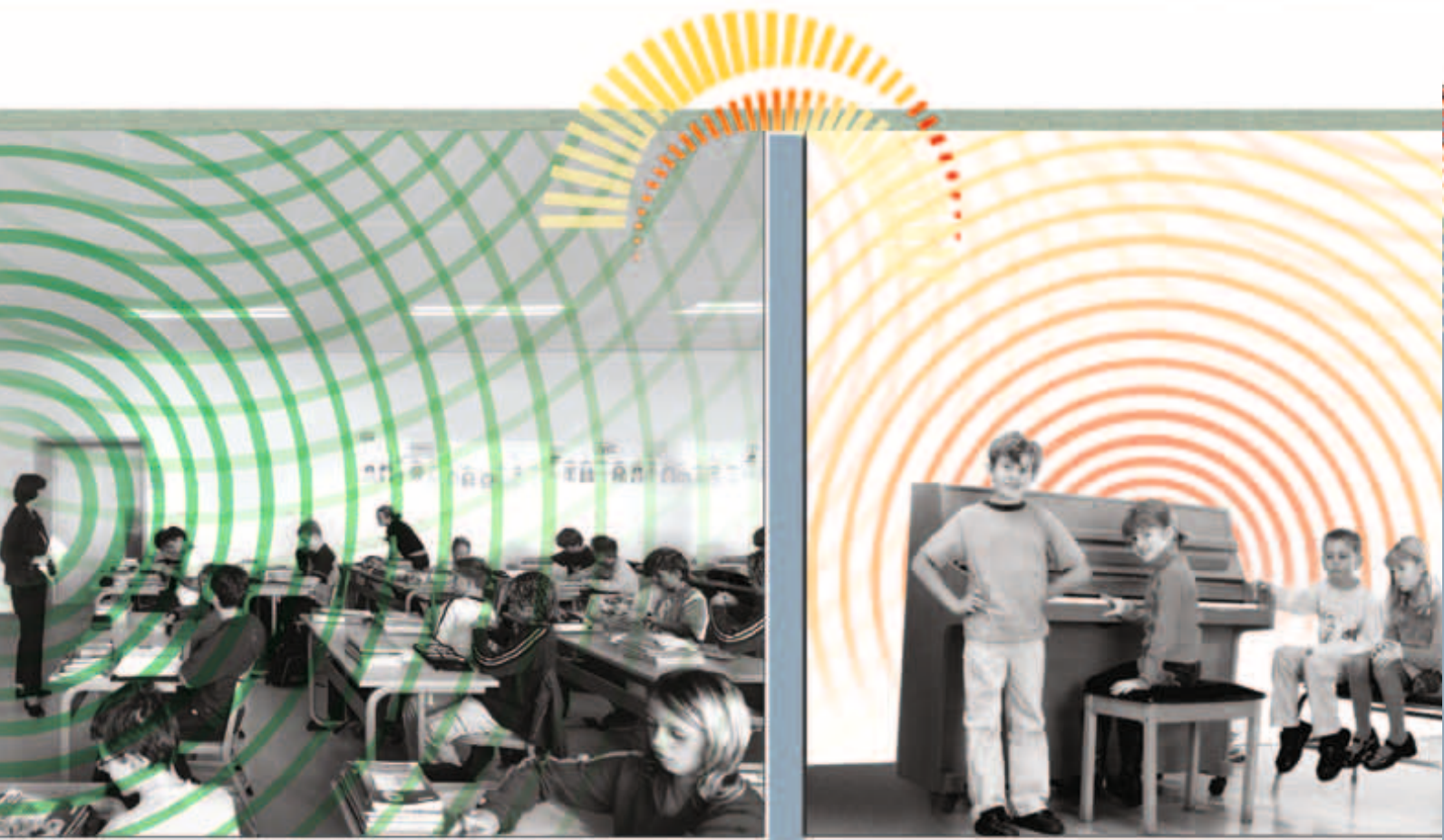
## Sound attenuation between rooms

Sound attenuation controls the amount of noise transferring through a wall or ceiling into a neighbouring space. AMF ceiling products are tested to BS EN ISO 20140-3.

Materials such as suspended ceilings work in conjunction with the wall or soffit, providing an additional sound barrier and thus a means for improving the sound attenuation.

**AMF Sound Insulating ceiling systems** - such as THERMATEX Fine Stratos micro 600 x 600 x 40 mm (SK) in an exposed grid system - can achieve an  $R_w$  value of up to 31 dB without any added insulation. Such performances mean good levels of noise control from above to below can be achieved, which is ideal for lightweight roofs (noise break in and rain noise control) and also for enhancing thin concrete slabs.

# SOUND INSULATION



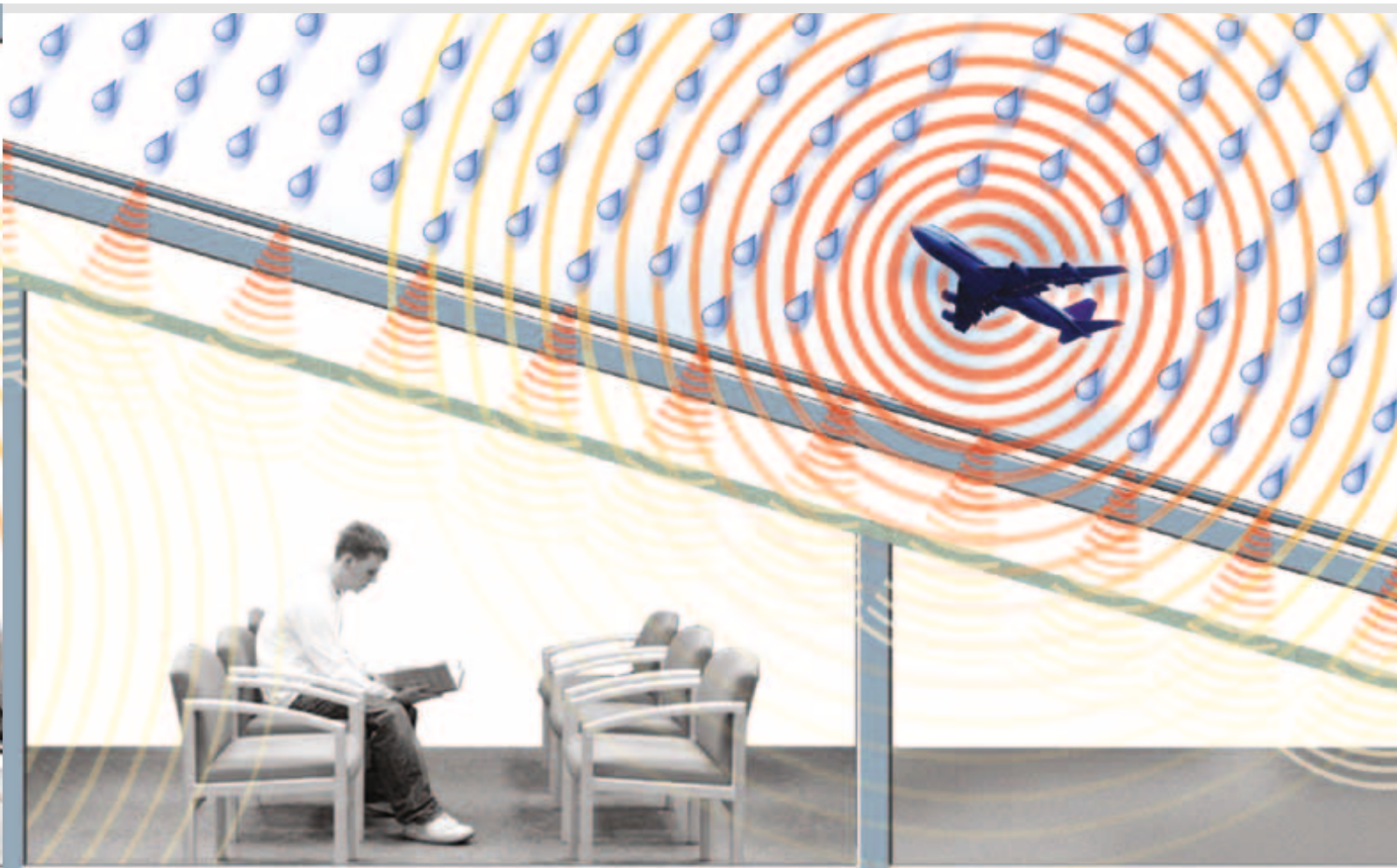
## Sound attenuation

The standard test for suspended ceiling systems is to measure the room-to-room sound insulation in accordance with EN 20140-9. With a defined void depth of 650 - 760 mm and a common ceiling plenum above adjacent rooms, the sound passes from one room through the ceiling twice and into the receiving room. The result is the normalised level difference measured as a  $D_{nc}$  value.

This is a laboratory test under controlled conditions. Practical performance on a building site is substantially affected by flanking sound, the structure borne transmission of sound along walls, floor and ceiling slabs, and also noise via service channels and other integrated systems.

THERMATEX dB Acoustic ceiling tiles provide exceptional sound attenuation with room-to-room insulation values of up to 43 dB. With the addition of low density mineral wool on the back, these values can be increased further. This means that it is possible to meet the horizontal room to room requirements even in circumstances where it is impracticable to build the partition up to the floor slab or roof due to either services in the ceiling void or by use of a profiled composite slabs or roof liner tray.



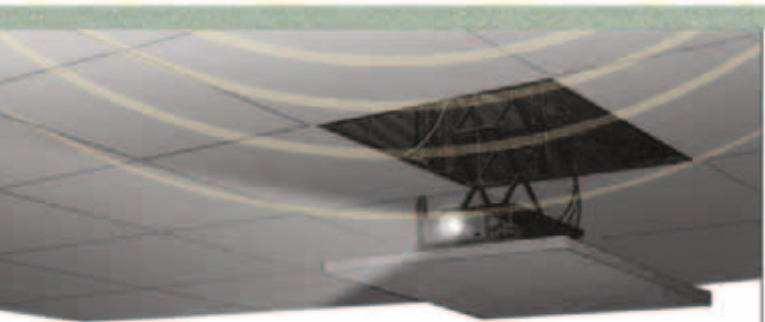


## External sound insulation

Environmental noise sources have recently been given greater consideration and new test methods are being developed to deal with specific concerns. The international standard EN ISO 140-18 is the laboratory measurement of sound generated by rainfall on building elements. With rain noise levels in buildings as high as 70 to 80 dB, this can have a dramatic effect on speech intelligibility. Tests have been made with and without an AMF suspended ceiling system under a metal roof system. 19 mm THERMATEX and THERMATEX dB Acoustic ceiling tiles have reduced rain noise by up to 16 dB which is subjectively three times quieter.



# SOUND INSULATION



## Impact sound insulation

Impact sound can be created by the noise of footsteps from the floor above travelling down through the void and the suspended ceiling. This is tested by measuring the sound pressure levels in the receiving room from noise created by a tapping machine placed on the floor in the room above. Field measurements are in accordance with ISO 140-7 and evaluated as per ISO 717-2.

Very good test results have been achieved with THERMATEX Acoustic and THERMATEX dB Acoustic ceiling tiles. These results can be further improved by the use of anti-resonation suspension hangers.



## Requirements

Recent studies have shown that in a room there should be a maximum noise level of 38 dB (A) - at least 5 dB below speech volumes. Assuming that a percentage of students will always have hearing problems (in Germany 15 to 20 per cent of all pupils have aural difficulties), then ideally, external noise levels should be reduced to 35 dB (A). According to a U.S. study over 11 per cent of students have hearing problems, affects their speech comprehension and learning ability. As a result every third child with impaired hearing repeats at least one year during schooldays. Bad classroom acoustics are in part responsible. Even students with perfect hearing can struggle to understand a teacher's voice that is compromised by background noise. Within a teaching room there can be significant noise elements including overhead projection equipment and ventilations systems. These noise sources must be considered in terms of the above requirements. External noise from traffic or aircraft as well as from other rooms within the same building must be evaluated to meet the minimum requirements of regulations such as BB93.

### Maximal levels of external noise

UK	35 dB for normal teaching spaces and 30dB in rooms for the aurally impaired.
D	40 dB, 35 dB in certain cases
F	40 - 50 dB for schools other than nursery. 43 - 55 dB for nursery schools.

At design stage it is important that specifications incorporate the right acoustic options. AMF can give advice on the performance characteristics of the acoustic tile range, including free reverberation time calculations.

# EDUCATIONAL BUILDINGS AND ACOUSTIC DESIGN

AMF Ceilings has a comprehensive range of suspended ceiling systems which meet the requirements of section E4 of the Building Regulations. These include sound insulation, reverberation and indoor ambient levels for school buildings. The performance standards for section E4 are found in Building Bulletin 93 and summarised below.

Table 1 Type of room	Activity tolerance (Source Room)	Noise tolerance (Receiving room)	Upper limit for indoor ambient noise level, dB $L_{Aeq,30min}$	$T_{mf}$ (seconds)
Nursery school playrooms	High	Low	35	<0.6
Nursery school quiet rooms	Low	Low	35	<0.6
Primary school: classrooms, class bases, general teaching areas, small group rooms	Average	Low	35	<0.6
Secondary school: classrooms, general teaching areas, seminar rooms, tutorial rooms, language laboratories	Average	Low	35	<0.8
Open-plan:				
Teaching areas	Average	Medium	40	<0.8
Resource areas	Average	Medium	40	<1.0
Music:				
Music classroom	Very high	Low	35	<1.0
Small practice/group room	Very high	Low	35	<0.8
Ensemble room	Very high	Very low	30	0.6 - 1.2
Performance/recital room	Very high	Very low	30	1.0 - 1.5
Recording studio	Very high	Very low	30	0.6 - 1.2
Control room for recording	High	Low	35	<0.5
Lecture rooms:				
Small (fewer than 50 people)	Average	Low	35	<0.8
Large (more than 50 people)	Average	Very low	30	<1.0
Classroom designed specifically for use by hearing impaired pupils (including speech therapy rooms)	Average	Very low	30	<0.4
Study rooms (individual study, withdrawal, remedial work, teacher preparation)	Low	Low	30	<0.8
Libraries:				
Quiet study areas	Low	Low	30	<1.0
Resource areas	Average	Medium	40	<1.0
Science laboratories	Average	Medium	40	<0.8
Drama studios	High	Very low	30	<1.0
Design and Technology:				
Resistant materials, CAD/CAM areas	High	High	40	<0.8
Electronics/control, textiles, food, graphics, design/resource areas	Average	Medium	40	<0.8
Art rooms	Average	Medium	40	<0.8
Assembly halls, multi-purpose halls (drama, PE, audio-visual presentations, assembly, occasional music)	High	Low	35	0.8 - 1.2
Audio-visual, video conference rooms	Average	Low	35	<0.8
Atria, circulation spaces used by pupils	Average	Medium	45	<1.5
Indoor sports hall	High	Medium	40	<1.5
Dance studio	High	Medium	40	<1.2
Gymnasium	High	Medium	40	<1.5
Swimming pool	High	High	50	<2.0
Interviewing / counselling / medical rooms	Low	Low	35	<0.8
Dining rooms	High	High	45	<1.0
Ancillary spaces:				
Kitchen	High	High	50	<1.5
Offices, staff rooms	High	Medium	40	<1.0
Corridors, stairwells	Average-High	High	45	separate table
Coats and changing areas	High	High	45	<1.5
Toilets	Average	High	50	<1.5





## Design requirements

Building Control authorities are likely to require the following design information based on Building Bulletin 93 requirements:

- Performance standards for reverberation times in teaching and study areas.
- Performance standards for airborne sound insulation between rooms and impact sound insulation of floors.
- Absorption treatment for corridors, entrance halls and stairways.
- Performance standard for speed intelligibility (STI) in open-plan spaces.

### Reverberation Times in Teaching and Study Areas

Table 1 on page I summarises in column four the average reverberation time requirements between 500Hz and 2kHz for teaching and study areas as required by BB93.

Speed intelligibility and sound clarity in classrooms are very important and the reverberation of sound in those areas can have a dramatic effect on the ability of both pupils and teachers to hear and distinguish sounds.

AMF produces a range of sound absorbent tiles devised to control reverberation and to contribute to the acoustic qualities of areas in which it is installed.

## AMF ceilings tiles: sound absorption to EN 11654

Table 2

THERMATEX Product	$\alpha_w$	Absorption Class
THERMATEX Alpha, THERMATEX Alpha ONE	0.90 - 1.00	A
Thermofon, FIBRAFUTURA THERMATEX Silence	0.80 - 0.85	B
Fine Stratos micro, THERMATEX Acoustic, Thermatex dB Acoustic, Mercure, Kombimetall perf.	0.60 - 0.75	C
Pinhole	0.30 - 0.55	D
THERMATEX Acoustic RL, Kombimetall plain	0.15 - 0.25	E
Fine Stratos, Laguna, Plain	0.05 - 0.10	Reflecting

Table Indoor Ambient Noise Levels and Rain Noise summarises in column three the requirements for minimum indoor ambient noise levels, including external noise contributed by transportation and industrial and commercial premises; and building services within the structure, such as plant and machinery. Suspended ceilings can contribute to the necessary sound insulation required to achieve those indoor ambient noise levels. AMF has a wide range of high density ceiling tiles at greater thicknesses than the industry norms which offer significant performance specifications. Although not yet required by the BB93 standard, rain noise on lightweight roofs is a significant factor in increasing indoor ambient noise levels. AMF tiles have been tested under a metal insulated roofing system in accordance with EN ISO 140-18 and contributed to the reduction of rain noise.

### AMF Impact Sound Insulation, Tested To EN ISO 140-18

Metal insulated roofing system	- 72 dB (A)
Metal insulated roofing system with THERMATEX Fine Stratos ceiling tiles 600 mm x 600 mm x 19 mm	- 58 dB (A)
Metal insulated roofing system with THERMATEX dB Acoustic ceiling tiles 600 m x 600 mm x 24 mm	- 56 dB (A)



## Sound insulation between internal spaces

## Criteria for corridors, foyers and stairwells

Building Bulletin 93 makes recommendations on the noise levels that an activity room will generate and the receiving room will tolerate (see tables 1 and 2). These criteria are then used to determine the minimum levels of airborne sound insulation between noncirculation spaces, as seen in BB93 table 3.

Building Bulletin 93 requires additional sound absorption in corridors, entrance and stairwells to prevent sound interfering with teaching and studying in adjacent rooms. The calculation is done in accordance with Section 7 of Approved Document E, which requires either a Reverberation Time calculation or the use of a Class C absorber for the area of the floor or greater.

Table 3

Minimum $D_{nT}$ ( $T_{mf,max}$ ), W	Activity noise in source room				
		Low	Average	High	Very high
Noise tolerance in receiving room	High	30	35	45	55
	Medium	35	40	50	55
	Low	40	45	55	55
	Very Low	45	50	55	60

AMF provides a range of tiles that meet the Class C absorption requirements or exceed this standard (see table 2). In addition the sound insulation of many of these AMF tiles will contribute significantly to reducing noise levels between adjacent spaces.

There is also a requirement to attenuate impact sound such as footsteps transmitted into spaces via the floor. AMF ceiling tiles can produce  $R_W$  levels of up to 30 dB, which combined with the structure is able to provide the airborne and impact sound insulation required by Building Bulletin 93.

# ROTHERHAM SCHOOLS - A STUDY IN ACOUSTICS

PFI Schools form a fast-expanding part of the British construction industry and all new school buildings and extensions must comply with Building Regulations. The acoustic design of schools is framed in Building Bulletin 93 regulations in conjunction with Approved Document E of the Building Regulations.

Sound absorption is an important element of BB93, with a detailed list of reverberation times for different types of rooms. AMF has a wide range of products that can meet these requirements and help to provide the necessary acoustic correction to meet the speech intelligibility criteria of BB93. Of even greater importance is sound insulation...and at Rotherham Schools the main contractor Balfour Beatty needed a ceiling system that would achieve sound reduction values of up to 44 dB  $D_{ncw}$ .

Initial thoughts about using a plasterboard system plus an acoustic ceiling were rejected because of both the high costs and time-consuming installation in providing two ceiling systems. AMF offered THERMATEX dB Acoustic and THERMATEX Fine Stratos in 24 mm thickness to provide the necessary airborne and impact sound insulation from rooms and corridors above classrooms. These tiles are both Class C sound absorbers and as such provided the significant levels of acoustic absorption that is required by the BB93 regulations.



In the gymnasium there was a need for a strong, impact-resistant ceiling that also had a pre-decorated finish for quick installation and a significant acoustic performance. FIBRAFUTURA is manufactured from woodwool cement, offering a robust, durable tile that achieves a good level of sound absorption.

In areas where a functional, decorative tile with good sound absorption was needed, AMF ECOMIN Filigran proved a highly cost-effective solution. The bright white face with micro-perforations offers a clean finish combined with excellent sound absorption for classroom areas.

For kitchen areas AMF THERMATEX Therma-clean S with its hygienic washable facing was the preferred choice. Tested to both European Clean room standards as well as providing a bactericidal treatment, AMF THERMATEX Therma-clean S is a versatile product that can be utilised where cleanliness and washability is a prime requirement.

Balfour Beatty were provided with a complete package of AMF tiles that offered a range of high performance acoustic characteristics as well as other practical benefits and at a much lower cost than the original specifications.

AMF has a continuing commitment to product development and testing. Recent tests

at Sound Research Laboratories on a range of ceiling tiles have produced some excellent results. As the first ceiling tile manufacturer to test its products in accordance with the draft standard for the impact of Rain Noise on roof materials (ISO 140-18) AMF is leading the way in providing solutions for excessive noise radiating into occupied space below. This is a specific acoustic problem found in school and highlighted as an issue in BB93.

In addition impact and airborne sound insulation testing has been carried out with a number of different AMF products installed in conjunction with a 150mm precast hollow cored floor.  $R_w$  values of up to 61 dB were achieved for airborne insulation while impact ratings reached 67  $L_{nw}$  dB. In certain areas it would be possible to achieve BB93 conformity by using a suspended ceiling rather than the more expensive, time-consuming and inconvenient method of upgrading existing flooring.

For corridors, foyers and stairwells as defined in section 7 of Part E of the Building Regulations, method A defines that a class C absorber is required to provide the correct reverberation times in these areas. AMF produces a number of different face patterns, thickness and edge details for tiles that achieve the Class C rating and these can be seamlessly incorporated with other products used within school buildings.



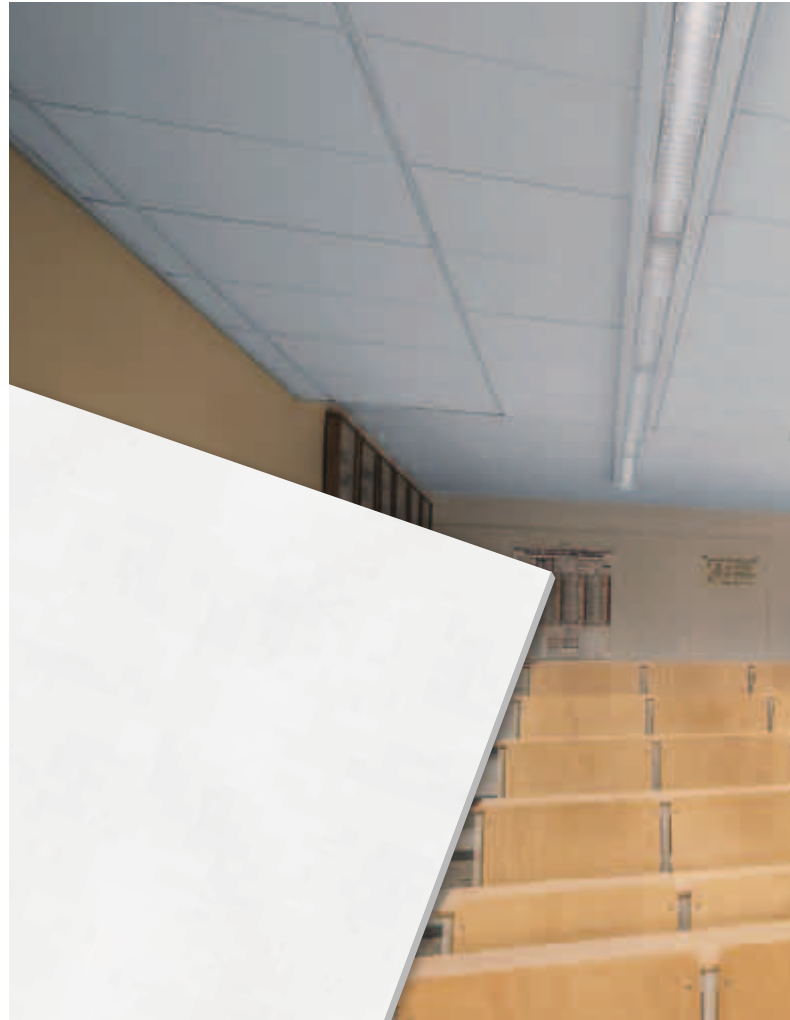
# AMF ACOUSTIC SOLUTIONS

The products in the AMF Acoustic range bring together high sound absorption and high sound reduction. This means that the reverberation time in a room can be controlled, and the noise coming from neighbouring rooms or outside the building can also be reduced.

These types of products are particularly suitable for education facilities where acoustic control is critical. The THERMATEX Acoustic range of smooth white fleece covered products, cover a range of tiles with differing acoustic values with the same aesthetic finish. This allows an identical face pattern to be carried throughout a building where there various spaces have different acoustic requirements.

## THERMATEX ACOUSTIC RANGE BENEFITS

- One face pattern for a spectrum of sound absorption values
- Tile options from low to high absorption
- Attenuation figures from 26 dB to 44 dB
- Acoustics combined with fire protection
- A combination of acoustic properties in one suspended ceiling
- Building material class A2-s1,d0 as per EN 13501-1

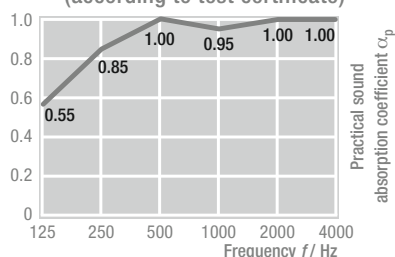


### THERMATEX Alpha ONE

THERMATEX Alpha ONE is a new wet-felt mineral tile which provides highest sound absorption values.

System: C  
Edges: SK, VT-S 15/24  
VT-15/24 on request  
Sizes: 600 x 600 mm  
625 x 625 mm  
Further sizes available to order  
Thickness: 24 mm (c. 3.8 kg/m<sup>2</sup>)

$\alpha_w = 1.00$  as per EN ISO 11654  
 $NRC = 1.00$  as per ASTM C 423  
extremely absorbing  
 $D_{n,f,w} = 29$  dB as per EN 10848  
(according to test certificate)

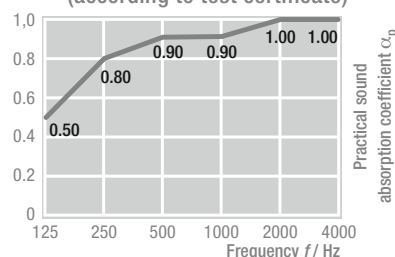


### THERMATEX Alpha

THERMATEX Alpha is a high absorption mineral tile produced by the wet-felt process. In addition to Class A sound absorption THERMATEX Alpha also offers good fire protection and excellent handling.

System: C  
Edges: SK, VT-S 15/24  
VT-15/24 on request  
Sizes: 600 x 600 mm,  
600 x 1200 mm,  
625 x 625 mm  
Further sizes available to order  
Thickness: 19 mm (c. 3.0 kg/m<sup>2</sup>)

$\alpha_w = 0.95$  as per EN ISO 11654  
 $NRC = 0.90$  as per ASTM C 423  
extremely absorbing  
 $D_{n,f,w} = 28$  dB as per EN 10848  
(according to test certificate)



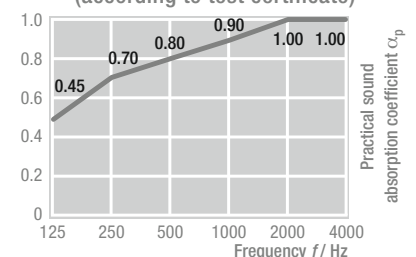
**NEW VALUES**

### THERMATEX Alpha HD

THERMATEX Alpha HD offers the benefits of an extremely absorbing ceiling tile combined with a concealed grid construction.

Systems: F, I, A  
Edges: AW/GN, AW/SK, GN/SK  
Sizes: 300 x 1800 mm,  
600 x 600 mm,  
625 x 625 mm  
Further sizes available to order  
Thickness: 19 mm (c. 3.6 kg/m<sup>2</sup>)

$\alpha_w = 0.90$  as per EN ISO 11654  
 $NRC = 0.85$  as per ASTM C 423  
extremely absorbing  
 $D_{n,f,w} = 30$  dB as per EN 10848  
(according to test certificate)



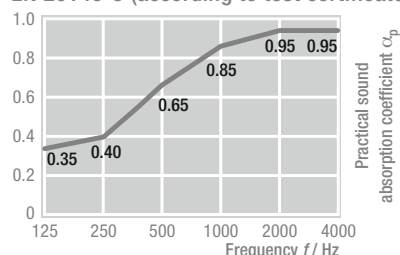


## THERMATEX Acoustic

THERMATEX Acoustic combines excellent sound absorption and good sound attenuation to provide high performance requirements for acoustical comfort.

Systems: C, F, I, A  
 Edges: SK, VT 15/24, AW, GN  
 Sizes: 600 x 600 mm,  
 1200 x 600 mm,  
 625 x 625 mm,  
 300 x 1200 - 1800 mm  
 Further sizes available to order  
 Thickness: 19 mm (c. 4.6 kg/m<sup>2</sup>)

$\alpha_w = 0.65$  (H) as per EN ISO 11654  
 NRC = 0.70 as per ASTM C 423  
 highly absorbing  
 $D_{n,c,w} = 38$  dB (40 dB for planks) as per  
 EN 20140-9 (according to test certificate)

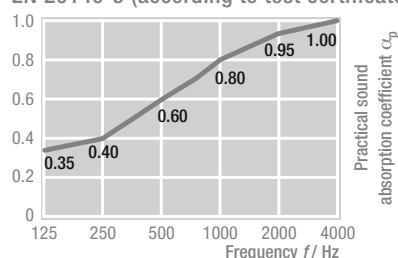


## THERMATEX dB Acoustic 24 mm

THERMATEX dB Acoustic 24 mm is a ceiling tile that provides a high level of sound attenuation and insulation. The tissue-faced perforated baseboard also ensures good sound absorption.

Systems: C, F, I  
 Edges: SK, VT 15/24, AW/SK, GN/SK  
 Sizes: 600 x 600 mm,  
 625 x 625 mm,  
 300 x 1800 mm  
 Further sizes available to order  
 Thickness: 24 mm (c. 8.4 kg/m<sup>2</sup>)

$\alpha_w = 0.65$  (H) as per EN ISO 11654  
 NRC = 0.70 as per ASTM C 423  
 highly absorbing  
 $D_{n,c,w} = 41$  dB (43 dB for planks) as per  
 EN 20140-9 (according to test certificate)

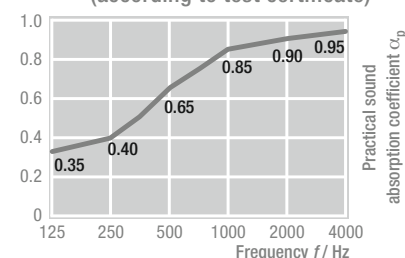


## THERMATEX dB Acoustic 30 mm

For outstanding sound attenuation to an enhanced performance level, THERMATEX dB Acoustic 30 mm with its extra 6 mm baseboard thickness meets this demand.

Systems: C, F, I  
 Edges: SK, VT 15/24, VT-S 15  
 Sizes: 600 x 600 mm,  
 625 x 625 mm,  
 300 x 1800 mm  
 Further sizes available to order  
 Thickness: 30 mm (c. 10.5 kg/m<sup>2</sup>)

$\alpha_w = 0.65$  (H) as per EN ISO 11654  
 NRC = 0.70 as per ASTM C 423  
 highly absorbing  
 $D_{n,c,w} = 43$  dB as per EN 20140-9  
 (according to test certificate)

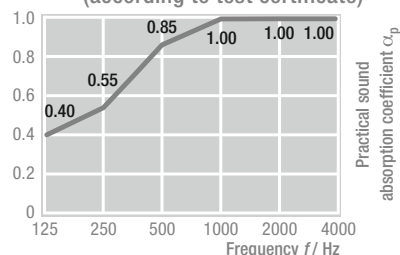


## THERMATEX Silence

THERMATEX Silence is a fleece coated ceiling made from two mineral boards bonded together. The special construction provides excellent sound absorption as well as high sound attenuation.

System: C  
 Edges: SK, VT 15/24, VT-S 15/24  
 Sizes: 600 x 600 mm,  
 625 x 625 mm,  
 600 x 1200 mm,  
 625 x 1250 mm  
 Further sizes available to order  
 Thickness: 43 mm (c. 10.8 kg/m<sup>2</sup>)

$\alpha_w = 0.85$  (H) as per EN ISO 11654  
 NRC = 0.90 as per ASTM C 423  
 extremely absorbing  
 $D_{n,f,w} = 44$  dB as per EN 10848  
 (according to test certificate)

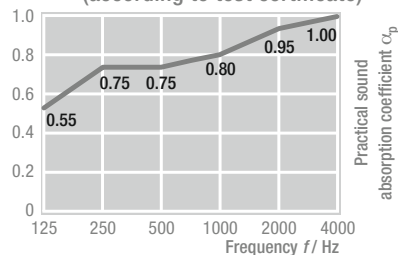


## THERMATEX Thermofon

THERMATEX Thermofon is a low density wet-felt mineral tile that offers excellent sound absorption values.

System: C  
 Edges: SK, VT-S 15/24  
 Sizes: 600 x 600 mm,  
 600 x 1200 mm,  
 625 x 625 mm  
 Thickness: 15 mm (c. 2.4 kg/m<sup>2</sup>)

$\alpha_w = 0.80$  (H) as per EN ISO 11654  
 NRC = 0.85 as per ASTM C 423  
 extremely absorbing  
 $D_{n,c,w} = 28$  dB as per EN 20140-9  
 (according to test certificate)

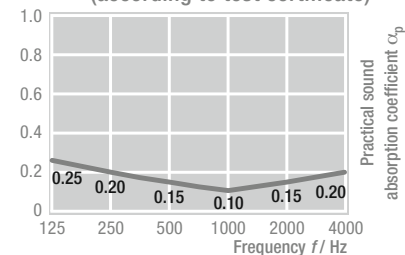


## THERMATEX Acoustic RL

THERMATEX Acoustic RL completes the product range as a ceiling tile with special sound reflection properties.

System: C  
 Edges: SK, VT 15/24  
 Sizes: 600 x 600 mm,  
 625 x 625 mm  
 Further sizes available to order  
 Thickness: 19 mm (c. 5.8 kg/m<sup>2</sup>)

$\alpha_w = 0.15$  (L) as per EN ISO 11654  
 NRC = 0.15 as per ASTM C 423  
 hardly absorbing  
 $D_{n,c,w} = 38$  dB as per EN 20140-9  
 (according to test certificate)



# AMF ACOUSTIC SOLUTIONS

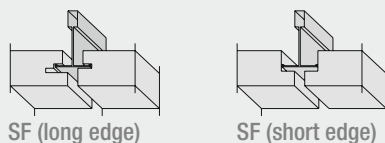


## THERMATEX SF Acoustic

This elegant new AMF performance ceiling with the attractive SF shadow edge requires minimal void as the tile is installed purely from below. Installation and removal of the individual tiles is achieved simply by a small shift of the tile along the tee grid. With its invisible perforation THERMATEX SF Acoustic achieves high values in sound absorption and once installed shows a white, homogeneous surface in a discreet module. For more contrast in ceiling design the tile can be installed on grid in various RAL colours.

THERMATEX SF Acoustic also scores well with good technical acoustic properties ( $\alpha_w$ -value of 0.65(H) according to EN ISO 11654).

### Edge details



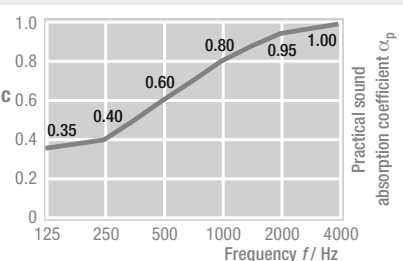
### SYSTEM

**C** Exposed system, demountable ceiling <sup>\*1</sup>

Building material class	■ A2-s1,d0 as per EN 13501-1
Sound absorption	■ EN ISO 354
Sound attenuation	■ $D_{n,c,w} = 38$ dB as per EN 20140-9 (24 mm thickness, as per test report)
Humidity	■ up to 95% RH
Light reflectance	■ up to 88%
Thermal conductivity	■ $\lambda = 0.052 - 0.057$ W/mK as per DIN 52612
Dimensions	■ For sizes as well as supply categories please consult the price list or <a href="http://www.amfceilings.com">www.amfceilings.com</a>
Thickness / weight	■ 24 mm (c. 8.4 kg/m <sup>2</sup> )
Colours	■ white similar to RAL 9010

### Sound absorption

Value for  
**THERMATEX SF Acoustic**  
24 mm  
 $\alpha_w = 0.65$  (H)  
as per EN ISO 11654  
 $NRC = 0.70$   
as per ASTM C 423  
highly absorbing



Further information on our products can be found in AMF Parts 1-6.





## Exposed System C

System C utilises the popular exposed suspension grid as a proactive element in ceiling design. Square edged (SK) ceiling panels are laid into the grid and give a flush visual appearance. Tiles with recessed edges (VT) allow greater creative design options with both 24 and 15 mm wide tee sections. All tiles are independently demountable, giving access to the ceiling void at all points.



## Exposed System F

System F is a free span ceiling system that is ideal for corridors. Spanning from wall to wall without intermediate fixings, AMF System F planks are available with both demountable and non-accessible edge details. A wide range of THERMATEX face patterns are available, as well as THERMATEX Acoustic and THERMATEX Kombimetall.

# SPECIAL REQUIREMENTS



## Fire protection

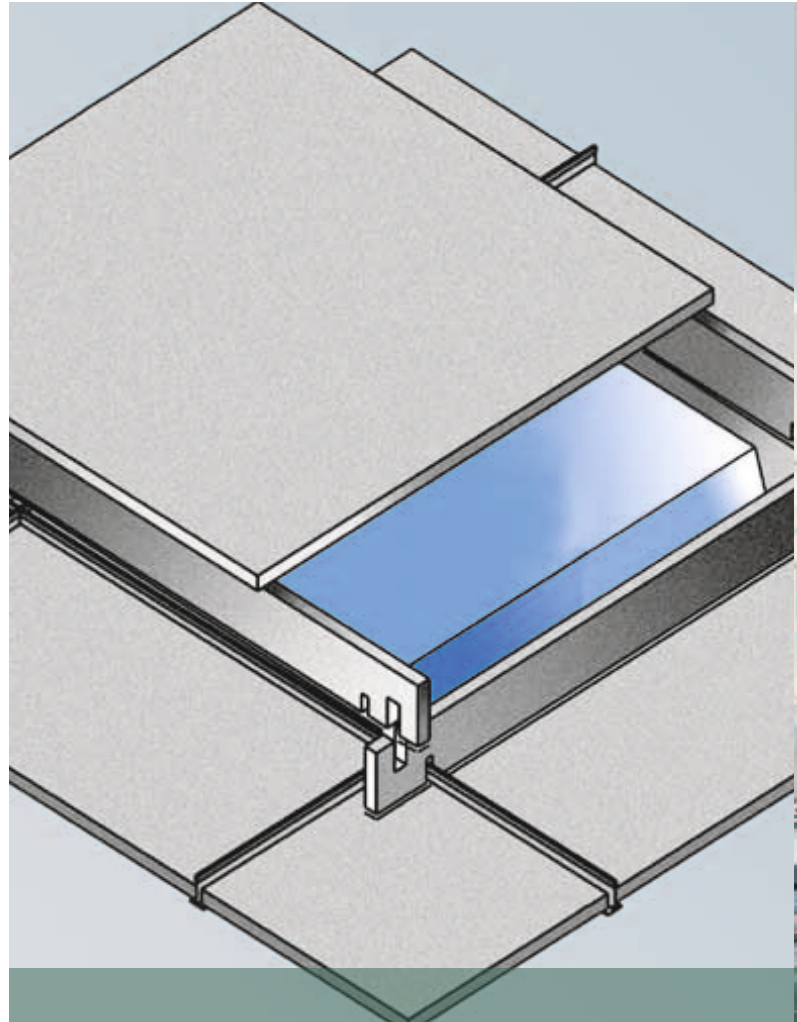
Fire safety in schools and educational buildings is paramount. Fire resistant ceilings can help to protect escape routes and provide fire compartmentation.

All AMF products meet Class 0 and Class 1 for reaction to fire requirements and many AMF systems provide structural fire resistance.

AMF THERMATEX Acoustic and THERMATEX Kombimetall tiles give up to 60 minutes fire protection to both steel beams - BS 476: Part 23 - and timber joists for the BS 476: Part 21 test.

Specialist panel and plank products are an important part of the AMF fire safety range, providing fire protection from above and below. Escape routes such as corridors are protected from fire above the ceiling while services in the void are safeguarded from fire in the space below.

AMF THERMATEX Uno, Mono and Dual panels all offer this specialist level of fire protection together with demountability and acoustic performance.



## Light box

Providing fire protection for fittings such as luminaires and downlighters as well as ensuring room-to-room sound attenuation values are maintained.



## Hygiene

In **kitchens, canteens** and other areas where food is handled, hygiene and cleanliness are key issues. THERMATEX Thermaclean S, THERMATEX Aquatec and Kombimetall ceilings can be wiped down and cleaned with standard cleaning agents. In addition these products meet the Clean Room classifications 3 to 6 of European standard ISO 14644-1.

**NEW  
FROM  
AMF**

## THERMATEX Aquatec

In rooms with permanently high humidity, such as swimming pools, sanitary facilities or large kitchens, special demands are placed on the ceiling in terms of humidity resistance. Due to its special composition, THERMATEX Aquatec resists humidity up to 100% RH. This means that it is dimensionally stable when exposed to high humidity and temperatures from 0° to 40°C. This makes THERMATEX Aquatec especially suitable for many applications, such as offices and retail in regions with a naturally high humidity like the the tropics. For thorough cleaning the THERMATEX Aquatec can also be washed. The THERMATEX Aquatec also has outstanding sound absorption providing an optimal solution for most hygiene applications.

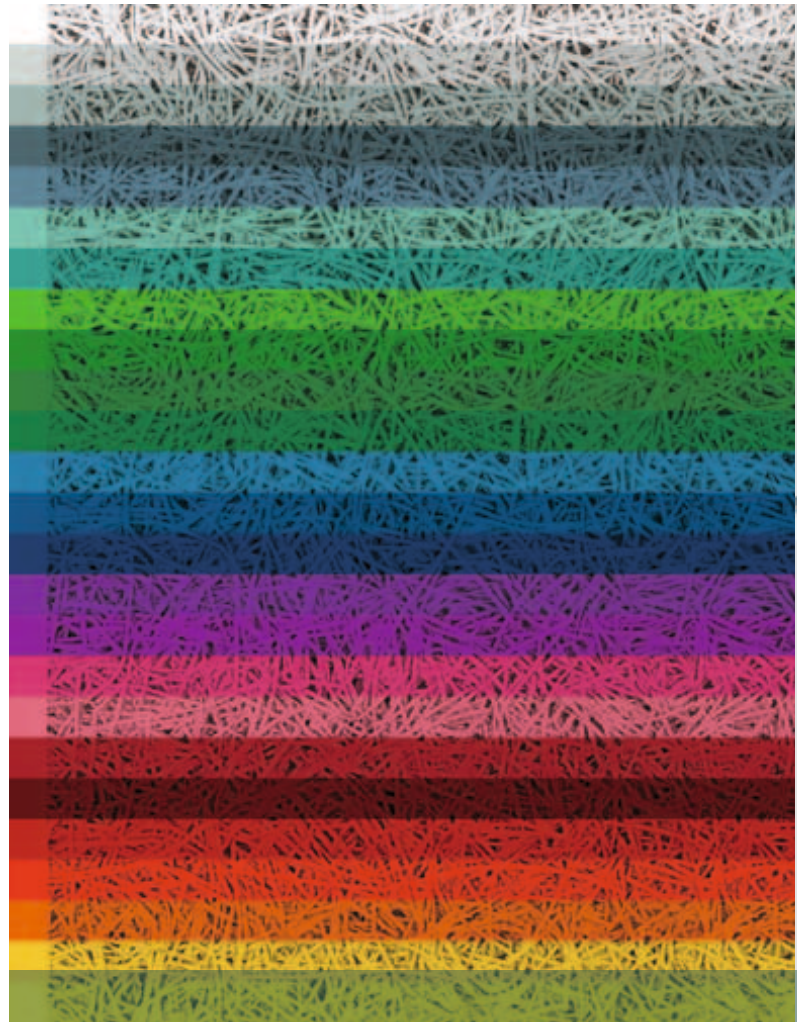


# SPECIAL REQUIREMENTS



Cathrin Stukhard / spa Vienna

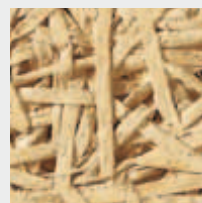
## Heradesign



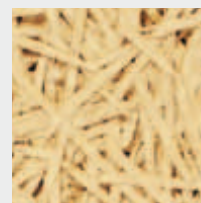
Heradesign develops, produces and distributes high-quality acoustic systems for ceilings and walls, based on wood wool. The products are distinguished by their universal design and various arrangement possibilities. The elegant, „warm“ character of the wood wool structure is what makes them unique. Decades of experience and competence, along with the company’s long tradition have lead to extraordinary acoustic solutions, improving the performance of our products as well as the level of satisfaction of our customers. Relaxation and concentration is what leads to success!

The main fields of application for Heradesign acoustic systems are:

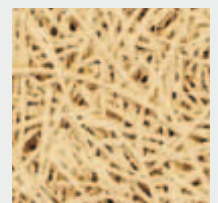
- Education
- Sports
- Office
- Infrastructure
- Entertainment
- Leisure



Heradesign *macro*



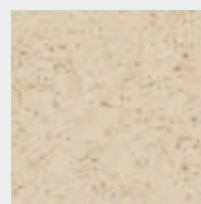
Heradesign *fine*



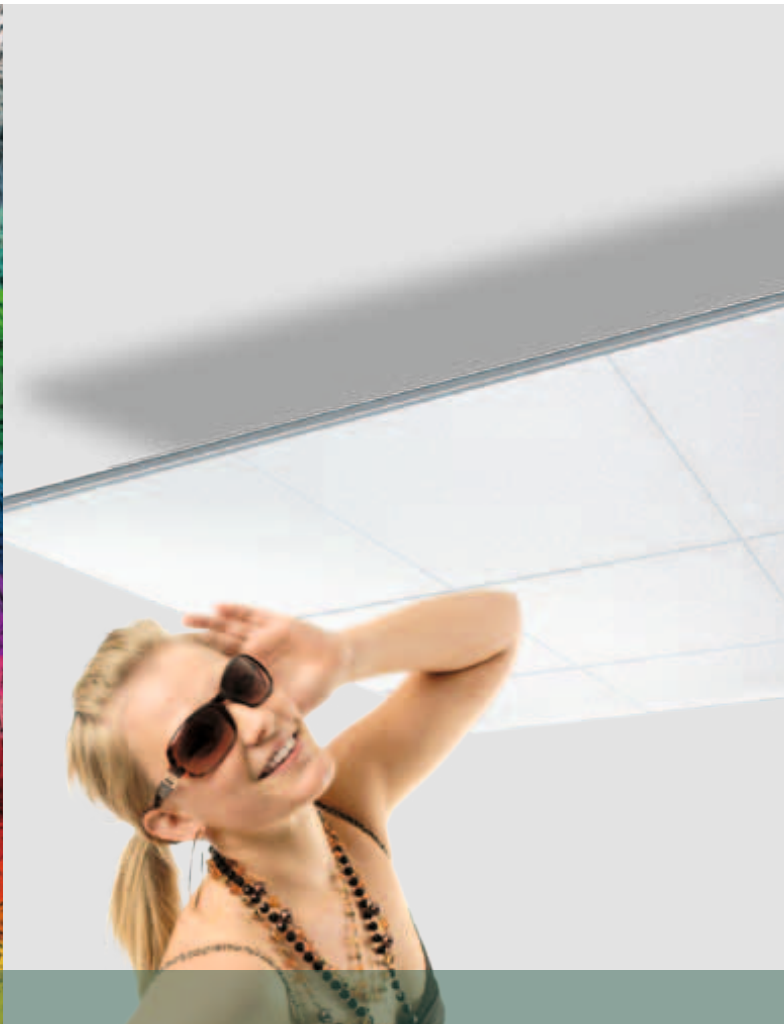
Heradesign *superfine*



Heradesign *micro*



Heradesign *plano*



## AMF Soundmosaic

The AMF Soundmosaic is a flat panel loudspeaker for a modular ceiling. The Soundmosaic works on the principle of wave conversion, this means the mineral fibre ceiling tile is the loudspeaker itself and looks identical to the rest of the AMF ceiling. The result offers a higher quality for both speech and music.



## Beamex System

Modern technology is now an integrated part of the education process. Video and computer projectors as well as projection screens can be integrated into AMF suspended ceilings, controlled remotely, and given protection against theft and vandalism. When required the panel is easily lowered and the projectors used immediately.



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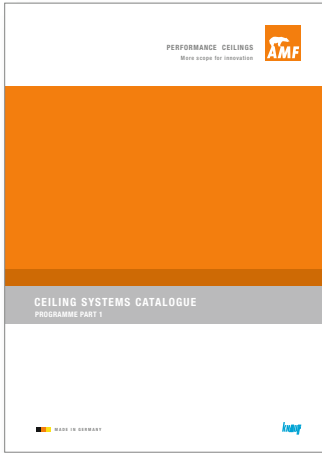
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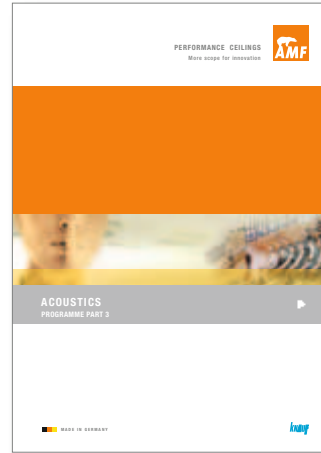
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Part 1



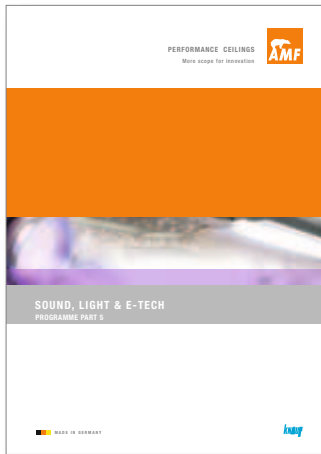
Part 2



Part 3



Part 4

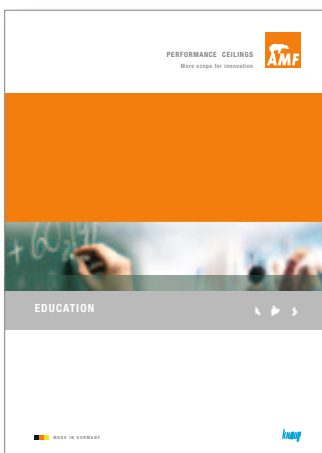


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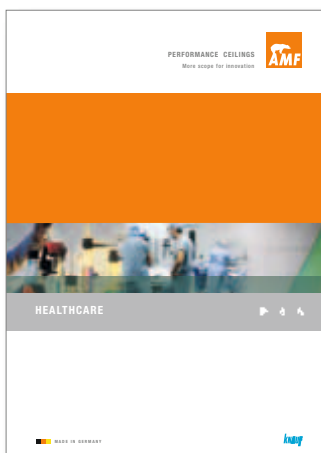


Part 6

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