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**lenofon**<sup>®</sup>  
acoustic by Holteg

**Product description**

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## What is it?

**lenofon** is an acoustic covering for ceilings and walls, for use in both new and restored buildings, made up of a soft fibre solid spruce panel with insulating layers of hemp and wood fibre.

Biological, ecological, and of excellent quality.

A new and exclusive covering for:

- >> Congress rooms, offices and laboratories
- >> Kindergartens, schools and public offices
- >> Hotels, restaurants and wellness centres
- >> Sitting and bed rooms.

## Why use noise absorbing coverings?

- >> Creates a pleasant and welcoming environment
- >> Improves communication and efficiency, and so productivity
- >> Reduces stress by limiting sound reverberation times.

Effectiveness confirmed by recognized studies:

- >> The human voice contains high, medium and low frequencies
- >> High frequencies are normally absorbed by carpets and furniture
- >> Optimum acoustics are reached only by absorbing low and medium frequencies
- >> Using the noise absorbing **lenofon** covering we have a product that offers optimum absorption of these lower frequencies too. **lenofon** is the first product that lets us obtain very compact structures with thickness less than 10 cm
- >> Measurements in the acoustic laboratory at the University of Rosenheim in Bavaria confirmed a minimum acoustic absorption coefficient  $\alpha_w = 0,5$  (LM), according to the height of the structure

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## COMPONENTS

Solid soft-fibre spruce

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Finger-jointed panels have no knots, resin pockets or other wood faults. Slow drying and the special production process reduce to a minimum any wood shrinkage or swelling. Panels are available with brushed surface which on request can be coloured with ecological paint.

### Solid soft-fibre spruce from Alpine forests

- >> Finger jointed, free of knots and other faults, excellent visual quality
- >> Slow and delicate drying (wood humidity approximately 11%)
- >> Simple brushed surface
- >> Colouring with biological dies on request
- >> Standard size: 33\*177,5\*2418mm
- >> CE certificate according to EN 14915
- >> Fire reaction class D-s2.d0. On request with fire-retardant finish



## COMPONENTS

### Solid wood panel - versions

#### lenofon classic

The standard version glamorizes every room with a unique expressiveness. Thanks to the 30 mm wide wooden bars, a special harmonious atmosphere can be created.

#### Specifications:

- Cover width: 177,5 mm
- Battens per panel: 5
- Batten width: 29,5 mm
- Slot width: 6 mm
- Degree of perforation: ca. 11%



#### lenofon fine

The filigree processing of the solid and finger-jointed timber gives the panel a stylish and unique look. In order to avoid flickering effects, the slot width alternates from 4 to 6 mm. Thanks to the special geometry of the slots, the perforation of the panel can be increased and a better sound absorption can be reached.

#### Specifications:

- Cover width: 177,5 mm
- Bars per panel: 10
- Bar width: 13 mm
- Slot width: 4 mm / 6 mm
- Perforation: ca. 16%



lenofon classic and lenofon fine can be combined with each other.

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## Product sheet - eco deluxe

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### a) Solid soft-fibre spruce from Alpine forests

### b) Glass filament fabric (to function as trickle protection)

- >> formed by the association of continuous glass filaments
- >> trickle protection against powder and insulating fibres
- >> Material properties: thickness 0,17 mm, weight 130 g/m<sup>2</sup>, color black
- >> fire behaviour according to DIN 4102 - A2

### c) Noise absorbing and insulating panel

- >> single insulating layer consisting of a medium density wood fibreboard
- OR
- >> two insulating panels combined, one flexible in hemp fibre, the other rigid in wood fibre

#### Hemp fibre panel

- excellent soundproofing properties
- excellent heat insulation with low heat transmission coefficient
- excellent protection against summer heat due to high thermal inertia
- good humidity control due to high absorption capacity



#### Wood fibre panel

- excellent soundproofing properties in all application fields
- additional heat insulation
- breather characteristics -> no humidity accumulation behind the sound absorption coating
- no contaminant emission into the room air



Property	Unit	Value
Thermal conductivity	W/mK	0,041
Density	Kg/m <sup>3</sup>	~38
Resistance to air flow	kPa-s/m <sup>2</sup>	6,0
Specific heat capacity c	J/kg-K	1600
Fire reaction class as to DIN 4102	/	B2

Property	Unit	Value
Thermal conductivity	W/mK	0,040
Density	Kg/m <sup>3</sup>	~140
Resistance to air flow	kPa-s/m <sup>2</sup>	≥100
Specific heat capacity c	J/kg-K	2100
Fire reaction class as to DIN 4102	/	B2

## Product sheet - eco B1

### a) Solid soft-fibre spruce from Alpine forests

- >> the surface of the panel is treated with a fire-resistant coating (transparent or coloured)
- >> the fire-resistant coating complies with fire reaction class B1 (B-s2,d0), Emission class E0

### b) Glass filament fabric (to function as trickle protection)

- >> fire behaviour according to DIN 4102 - A2

### c) Noise absorbing and insulating panel

According to the acoustic demands, a large selection of absorber materials can be used. They all comply with the fire protection regulations and have biological and organic properties.

Basically two material types are used:

#### >> Polyester-insulation material

Especially for buildings where, due to the criteria of environmentally compatible construction, mineral- and glassfibre insulations cannot be used and where fire class DIN 4102-B1 has to be given.

- + good sound absorption
- + good processability
- + resistant to moisture and mould (perfect for damp interiors)

#### >> Formaldehyde free glasswool (Ursa PureOne)

PureOne is characterized by excellent processing quality and sustainability. Through the exemplary synergy of the natural raw materials sand and water, PureOne is able to bridge the gap between high-tech and environmental awareness.

- + excellent results in all sections (good sound absorption, excellent thermal insulation)
- + incombustible
- + easy to work with (non-irritant, nearly dust-free, odourless)
- + sustainability (more than 50% is formed by waste glass)

**Thickness:** available from 7 - 60 mm

**Weight:** available from 350 g/m<sup>2</sup> to 1.200 g/m<sup>2</sup>

**Colors:** black (also available in white on request)

Please contact us for further information.

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## Product sheet - flexy

**lenofon-flexy** is the flexible acoustic covering that can be installed on curved walls. It is composed of wood strips applied to a non-woven material made of non-contaminating polyester. The wind-up structure adapts to curved surfaces, such as columns and vaults, and it can also be used to cover several types of decorating elements.

### Versions:

Note that the bar and slot width of both versions corresponds to the standard panel and so they can be perfectly combined with each other.

#### >> sound absorbing

The wood strips are glued to a 10 mm polyester non-woven, whereby acoustical values comparable to **lenofon fine** can be achieved.

The direct or indirect installation (on the substructure) has to be chosen on an individual basis, but generally the mounting is very easy.

#### >> optical

This version is characterized by a very simple installation. The single wood strips are glued to a soft fabric. For the installation it is sufficient to fix the certificated hook and loop tapes (strength > 60 kg/m<sup>2</sup>) to the element to cover (e.g. vaults and columns). The center distance between the tapes should be max. 60 cm. This version is used for optical purposes; the sound absorption properties are not that important.

### Specifications:

**Wood bar dimension** (width\*height): 29,5 mm \* 14 mm  
**Slot width:** 4 mm oder 6 mm

**Element dimensions** (length\*width): 1200 mm \* 2400 mm (bars glued lengthwise or crosswise)  
**Structural height:** ca. 25 mm (sound absorbing version)  
ca. 17 mm (optical version)

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**References**

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## PROJECT

### Agricultural Center, Imst (Austria)

Realization: 2010  
Area: 190m<sup>2</sup> (ceiling)  
Product: **lenofon classic** with trickle protection + glass wool Ursa PureOne  
Application place: Restaurant - Bar

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## PROJECT

### Hotel Pfösl

(Nova Ponente, South Tyrol)

Realization: 2010

Area: 50m<sup>2</sup> (ceiling and walls), height 90 mm

Product: **lenofon classic**, trickle protection, hemp- and wood fibreboard

Application place: restaurant - Stube Clara

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## PROJECT

### Village community house (Collepietra, South Tyrol)

Realization: 2010

Area: ca.55m<sup>2</sup> (walls), height 50 mm / 200 mm

Product: lenofon classic, trickle protection, hemp- and wood fibreboard

Application place: rehearsal room

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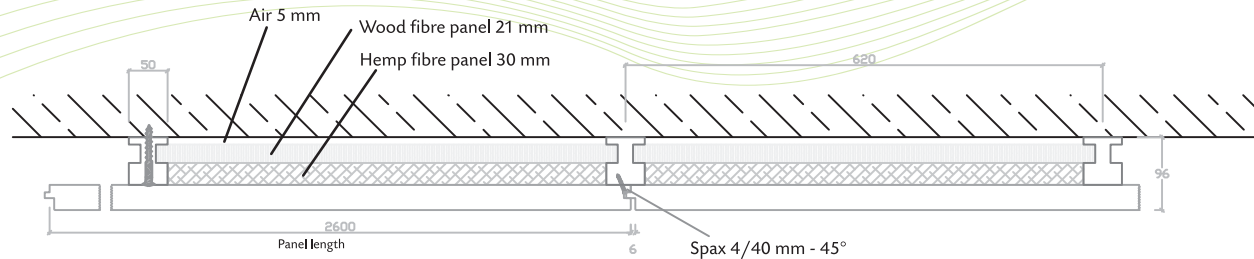
**Installation**

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## INSTALLATION

### Ceiling mounting - longitudinal section

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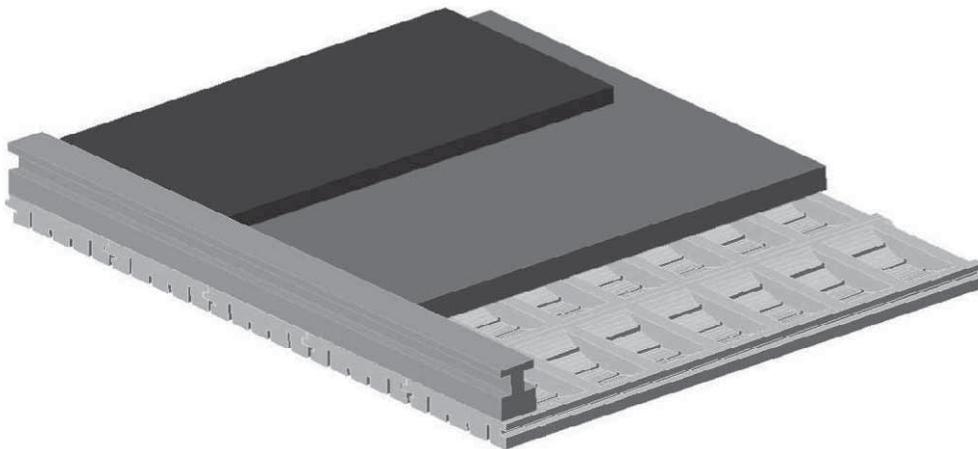
lenofon wood panels and soundproofing materials are combined to form a structure of thickness 90 mm.

This can be installed at the required height, adjusting the position of the sound absorbing panels as to the soundproofing needs.

Installing lenofon soundproofing panels by trained personnel requires approximately 40 minutes/m<sup>2</sup>.

#### Installation phases:

- Install the support strip sections and fasten them to the bare floor with expansion plugs (at 90° to the installation direction, pitch 60 cm).  
In the case of false ceilings, the supports are placed using the typical systems for this type of installation or crossed support strips as an alternative.
- Position the hemp fibre panel on the wood fibre panel and fasten with 4 screws (such as 40 mm Spax screws).  
Before placing the insulation layer between the support strips, assemble the wood and fibre panels on the floor or a trestle.
- Insert the insulation layer between the support strips using the specific installation slots.
- Install the wood fibre panels (which are tongued and grooved on all edges) using normal screws.  
If the chosen installation scheme needs the panels to be cut, you must create a new tongue or groove, as it is the side junction that ensures sufficient panel fastening.



## INSTALLATION

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Simple installation of the support structure, of the insulation layer and of the lenofon panels.

## INSTALLATION

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Thanks to the compact form of all components, the **lenofon** soundproofing panels can be easily placed even by a single fitter.



To install any flush-mounted fittings (e.g. lamps, speakers etc), cut the placed panels with an electric fret saw or a hole saw.



**Certificates**

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## MEASUREMENT AND CERTIFICATION OF THE SYSTEM

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### Excellent measuring results

The sound absorption properties of **lenofon** have been optimized and tested in collaboration with the University of Rosenheim. The test results show that **lenofon** soundproofing panels can guarantee good sound absorbing values, above all at medium and low frequencies.

**The sound absorption coefficient is  $\alpha = 0,50$  (LM) at least.**

This value is of special interest, as recent research has shown that sound absorption in the frequency range from 50 to 500 Hz, is considered the reference parameter to ensure good intelligibility of speech in closed areas. Studies made have shown that the best perception of syllables is reached using sound absorbing materials that have best performance in the frequency range from 50 to 500 Hz.



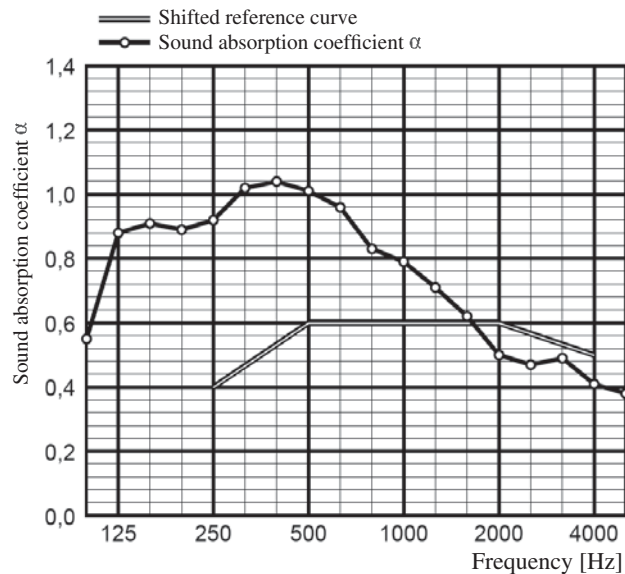
# SOUND ABSORPTION CERTIFICATE

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## lenofon eco deluxe (height 197 mm)

- Composition:
- 33 mm **lenofon classic** panel, slot 6mm
  - 0,13 mm glass filament fabric
  - 30 mm hemp fibreboard, density ~ 50 kg/m<sup>3</sup>
  - 22 mm wood fibreboard, density ~ 153 kg/m<sup>3</sup>
  - 112 mm air

Frequency [Hz]	$\alpha_s$ Third	$\alpha_p$ Octave
100	0,55	0,80
125	0,88	
160	0,91	
200	0,89	0,95
250	0,92	
315	1,02	
400	1,04	1,00
500	1,01	
630	0,96	
800	0,83	0,80
1000	0,79	
1250	0,71	
1600	0,62	
2000	0,50	0,55
2500	0,47	
3150	0,49	0,45
4000	0,41	
5000	0,38	



$\alpha_s$  Sound absorption coefficient according to ISO 354

$\alpha_p$  Sound absorption coefficient according to ISO 11654

Measurement according to ISO 11654:

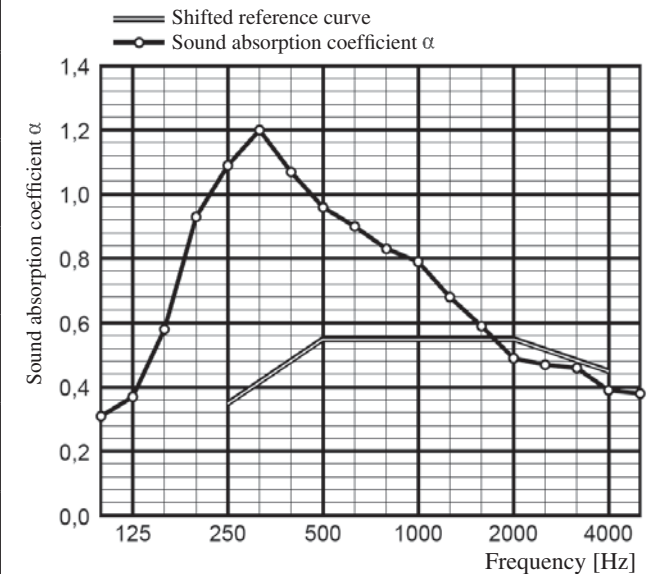
Measured sound absorption coefficient  $\alpha_w = 0,60$  (LM)

Sound absorption class: C

## lenofon eco deluxe (height 97 mm)

- Composition:
- 33 mm **lenofon classic** panel, slot 6 mm
  - 0,13 mm glass filament fabric
  - 30 mm hemp fibreboard, density ~ 50 kg/m<sup>3</sup>
  - 22 mm wood fibreboard, density ~ 153 kg/m<sup>3</sup>
  - 12 mm air

Frequency [Hz]	$\alpha_s$ Third	$\alpha_p$ Octave
100	0,31	0,40
125	0,37	
160	0,58	
200	0,93	1,00
250	1,09	
315	1,20	
400	1,07	1,00
500	0,96	
630	0,90	
800	0,83	0,75
1000	0,79	
1250	0,68	
1600	0,59	
2000	0,49	0,50
2500	0,47	
3150	0,46	0,40
4000	0,39	
5000	0,38	



$\alpha_s$  Sound absorption coefficient according to ISO 354

$\alpha_p$  Sound absorption coefficient according to ISO 116544

Measurement according to ISO 11654:

Measured sound absorption coefficient  $\alpha_w = 0,55$  (LM)

Sound absorption class: D

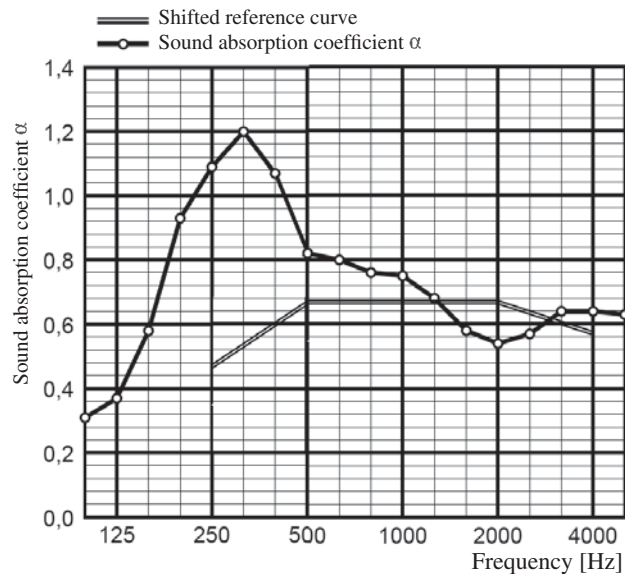
# SOUND ABSORPTION CERTIFICATE

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## lenofon fine eco deluxe (height 97 mm)

- Composition:
- 33 mm **lenofon fine** panel, slot 4 / 6 mm
  - 0,13 mm glass filament fabric
  - 30 mm hemp fibreboard, density ~ 50 kg/m<sup>3</sup>
  - 22 mm wood fibreboard, density ~ 153 kg/m<sup>3</sup>
  - 12 mm air

Frequency [Hz]	$\alpha_s$ Third	$\alpha_p$ Octave
100	0,30	
125	0,36	0,40
160	0,57	
200	0,94	
250	1,09	1,00
315	1,19	
400	1,05	
500	0,82	0,90
630	0,80	
800	0,76	
1000	0,75	0,75
1250	0,68	
1600	0,58	
2000	0,54	0,55
2500	0,57	
3150	0,64	
4000	0,64	0,65
5000	0,63	



$\alpha_s$  Sound absorption coefficient according to ISO 354

$\alpha_p$  Sound absorption coefficient according to ISO 11654

Measurement according to ISO 11654:

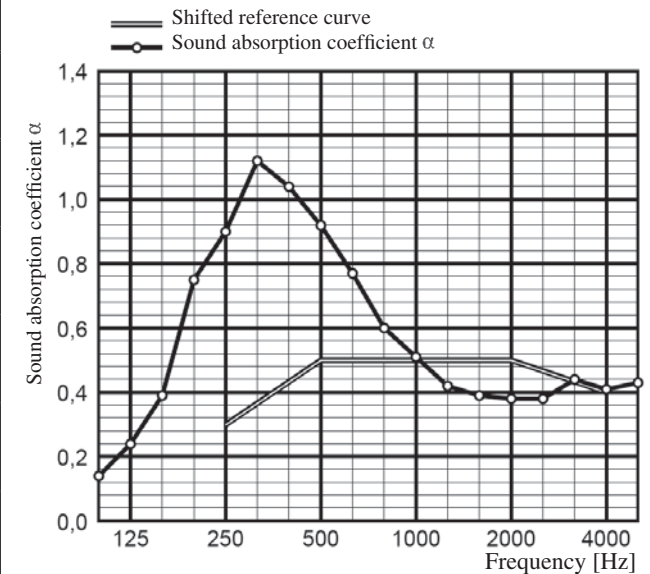
Measured sound absorption coefficient  $\alpha_w = 0,65$  (L)

Sound absorption class: C

## lenofon B1 (height 83 mm)

- Composition:
- 33 mm **lenofon classic** panel, slot 6mm
  - 0,13 mm glass filament fabric
  - 50 mm glass wool Ursa PureOne, density ~ 16 kg/m<sup>3</sup>

Frequency [Hz]	$\alpha_s$ Third	$\alpha_p$ Octave
100	0,14	
125	0,24	0,25
160	0,39	
200	0,75	
250	0,90	0,90
315	1,12	
400	1,04	
500	0,92	0,90
630	0,77	
800	0,60	
1000	0,51	0,50
1250	0,42	
1600	0,39	
2000	0,38	0,40
2500	0,38	
3150	0,44	
4000	0,41	0,45
5000	0,43	



$\alpha_s$  Sound absorption coefficient according to ISO 354

$\alpha_p$  Sound absorption coefficient according to ISO 11654

Measurement according to ISO 11654:

Measured sound absorption coefficient  $\alpha_w = 0,50$  (LM)

Sound absorption class: D

**Basics Acoustics**

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## BASICS ACOUSTICS

### Noise reduction

- >> Soundproofing (insulation) = building acoustics (e.g. reduction of noise due to footfalls, other nearby homes, road traffic)
- >> Sound absorption (damping) = architectural acoustics (e.g. clear perception of sounds, no echo, and reduced parasite noise)

The purpose of architectural acoustics is:  
to reduce the reverberation time (commonly known as „echo“). This result is reached by absorbing reflected sound.

#### The reverberation time is:

the time between emission of a sound and the complete interruption of its source. Ideal reverberation times vary according to the volume and usage of the area concerned.

#### Effects of a too long reverberation time on the acoustics of a room:

When speaking, a long reverberation time causes an overlap between successive syllables, with a masking effect that reduces clarity. In the case of music, persistence of low frequencies causes the sounds to melt together, with a confused or indistinct effect.

#### Effects of a too short reverberation time on the acoustics of a room:

If the reverberation time is too short, the impression is that of a “dry” sound, unsupported by the environment. Further, a short reverberation time in a large area can cause the sound volume to be too low at the far end of the room, as the sound reflections that otherwise would sustain volume are not present.

#### Sound absorbing materials do not absorb all frequencies to the same extent.

In the acoustical design of a room it is important to know the whole absorption spectrum of the sound absorbing material to be used.

For these materials, a general classification is used, based on the sound absorption coefficient ( $\alpha_w$ ). This lets us compare the various materials considered.

However to define the quality of a sound absorbing material on the basis of a single parameter is to over-simplify; actually, materials with the same sound absorption coefficient  $\alpha_w$  can have completely different absorption spectra.

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