

Acourete

# Material Akustik dan Aplikasinya

- *R. ARIEF YUDHISTIRA*
- *YANA M*
- *RETNO AJENG P*

#MENUJUSUARABAIK

WWW.ACOURETE.COM



# Outline.

## *ACOURETE & ACOUSTIC.*

- *ACOURETE COMPANY PROFILE*
- *ACOUSTIC*
- *SOUND BEHAVIOR AND ITS PROBLEM*


## *SOUND INSULATION & MATERIALS.*

- *BACKGROUND NOISE*
- *SOUND INSULATION*
- *INSULATION MATERIALS*

## *ROOM ACOUSTIC & MATERIALS.*

- *ROOM ACOUSTIC*
- *ACOUSTIC MATERIAL (ABSORBER & DIFFUSER)*

## ABOUT OUR COMPANY



Distraction takes many forms in various locations, such as rain, footsteps, engine noise, airplanes, road traffic noises, and music. In addition to the various disturbance challenges, there are also architectural challenges where materials must be able to blend in with the architectural design. Then, physical challenges in the form of extreme conditions such as humidity, air temperature, dust, and others.

Since 2006 Acourete (Acoustic Revolutionary Technology) has been present in Indonesia to answer all the challenges that have been mentioned. With the spirit of revolutionary thinking, Acourete comes with revolutionary technology, to answer various challenges that are difficult to overcome with generic products available in the market.

We have best revolutionary material solutions,

1. High acoustic performance
2. Easy to apply
3. Blend with design challenges and environmental conditions
4. Meet the criteria for green and healthy buildings.

Come join us to carry out the Technological Revolution to produce healthy sound quality !

# PRODUCTS SOLUTIONS



## Acoustics for Transportations

Noise Control inside the transportation



## Building Acoustics

Noise control from Around The Building or Room



## Architectural Acoustics

Noise Control Around The Room



## Acoustics for Industrial

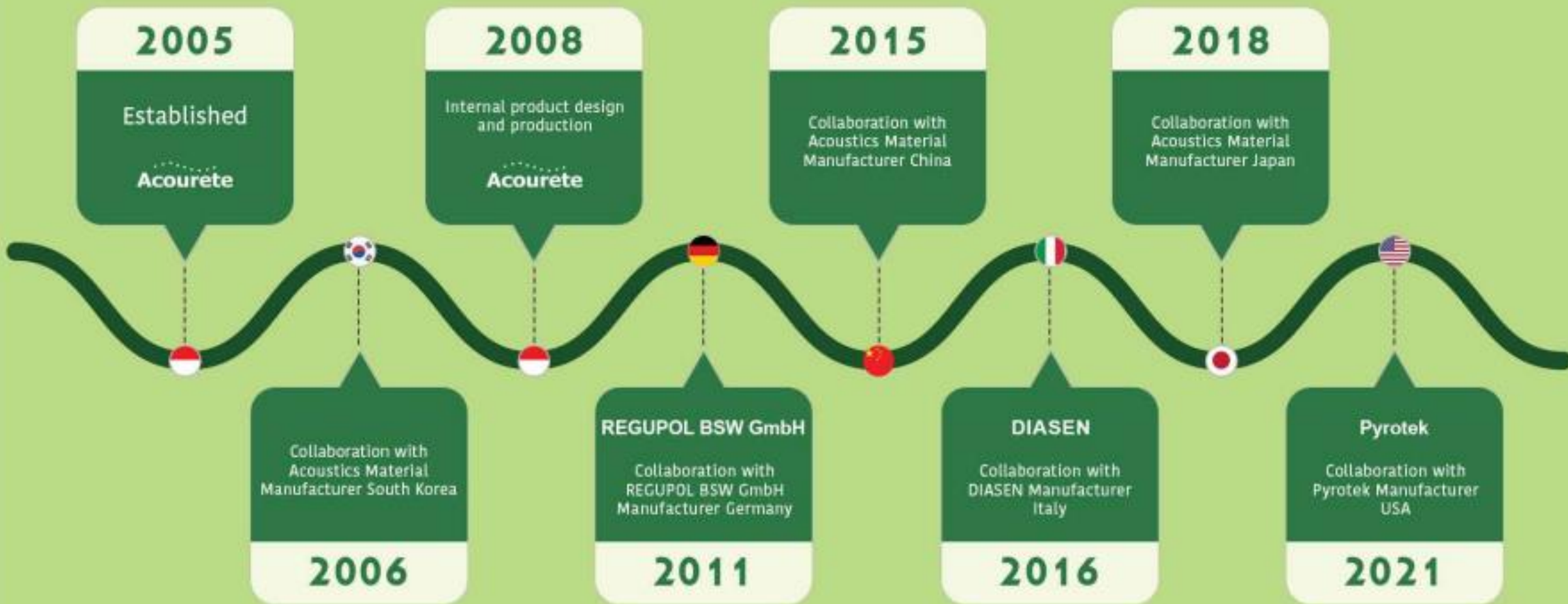
Industrial Machinery Noise Control and Around The Room



## Acoustic Treatment

Noise Control for Better Quality

# PRODUCT DEVELOPMENT OF ACOURETE ACOUSTICS



# OUR CLIENT

FOR ALMOST 20 YEARS, ACOURETE HAS BEEN TRUSTED TO ASSIST IN COMPLETING MORE THAN 100 ACOUSTIC PROJECTS



# Acoustics.

# Acoustics

**ACOUSTICS** IS THE SCIENCE THAT DEALS WITH THE PRODUCTION, CONTROL, TRANSMISSION, RECEPTION, AND EFFECTS OF SOUND (AS DEFINED BY MERRIAM-WEBSTER).

**SOUND** IS A VIBRATION THAT PROPAGATES AS AN ACOUSTIC WAVE THROUGH A TRANSMISSION MEDIUM SUCH AS A GAS, LIQUID OR SOLID.

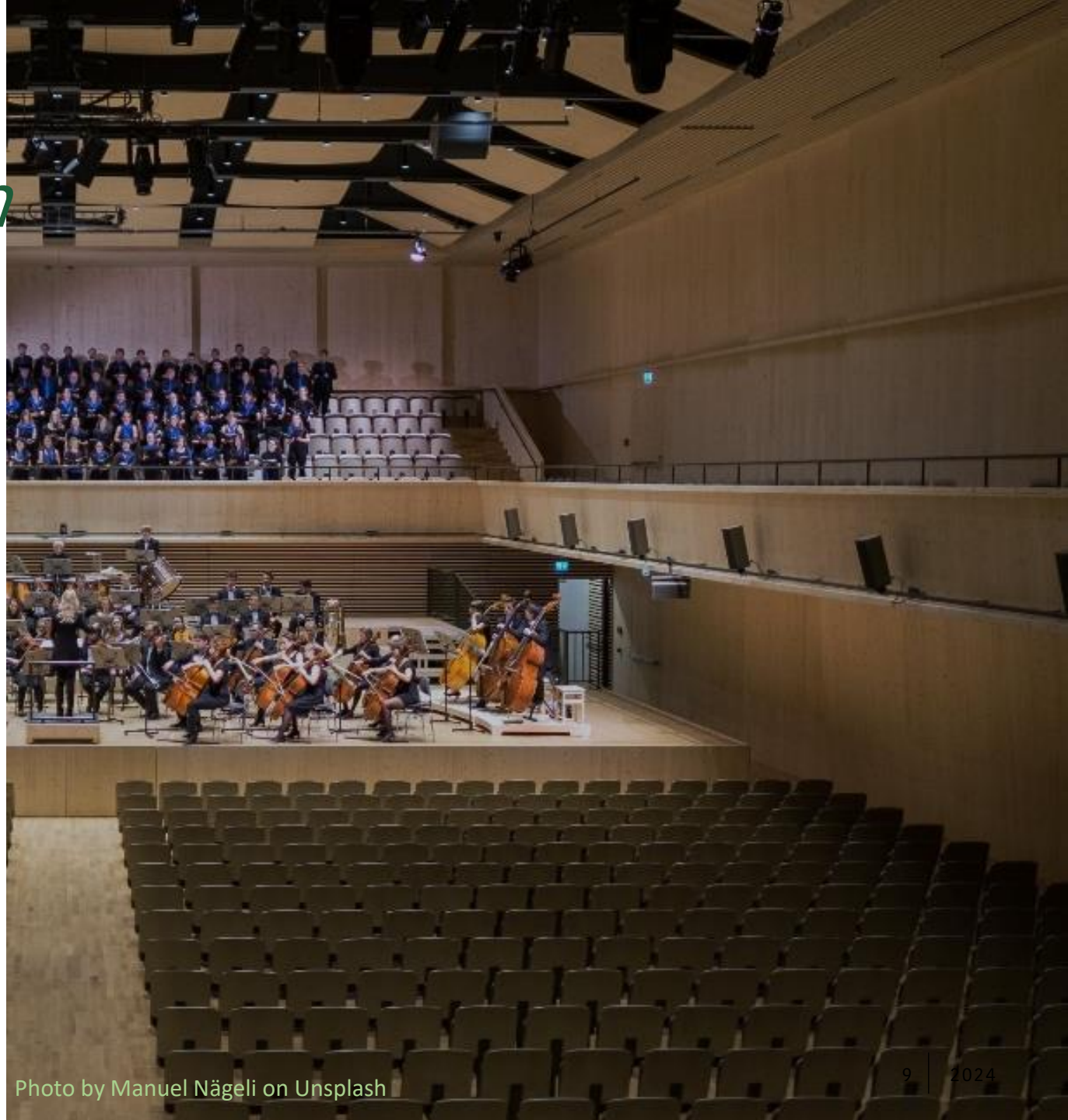




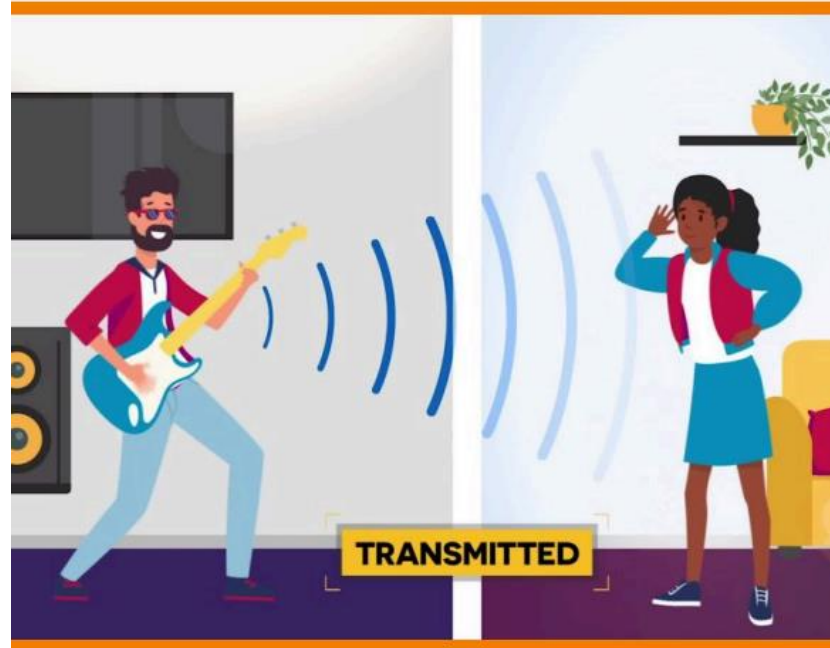
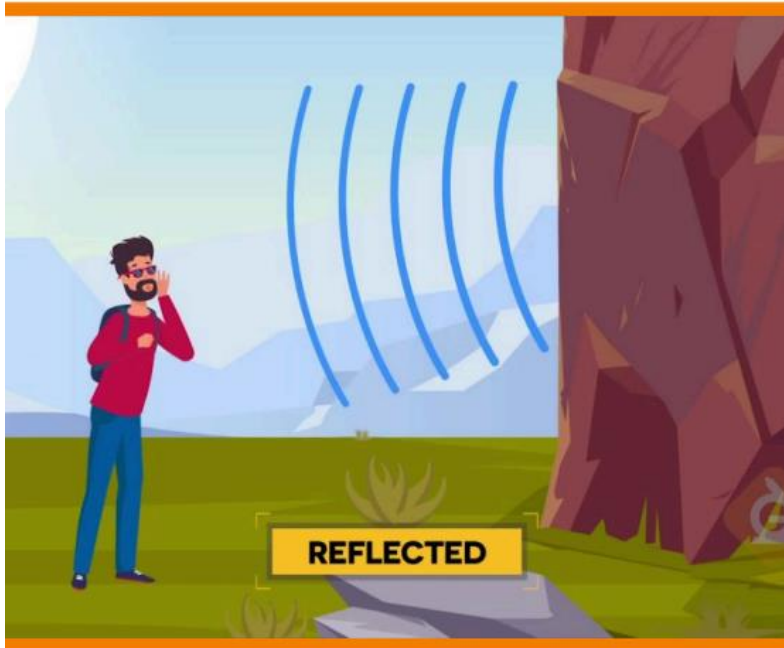
## *2 types of acoustics in an architectural building..*

**BUILDING ACOUSTICS** – SOUND INSULATION AND SOUND PROOFING. HOW SOUND TRANSMITTED AND TRANSFERRED THROUGH PARTITIONS

**ARCHITECTURAL ACOUSTICS** – ROOM ACOUSTICS. HOW SOUND BOUNCED AROUND WITHIN SPACE AND REFLECTED ON THE SURFACES.



# Sound can be reflected, transmitted, and absorbed



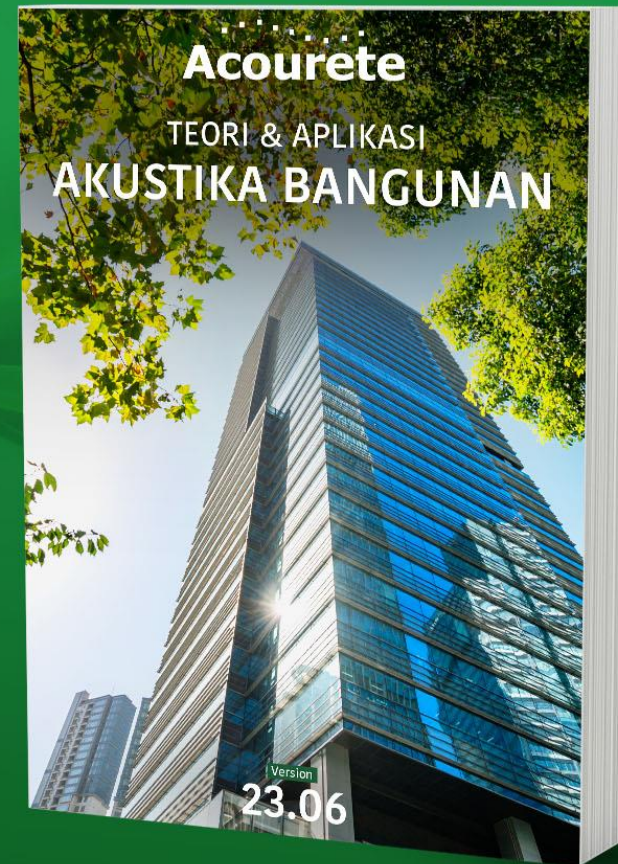
<https://www.generationgenius.com/wp-content/uploads/reading-material/wave-reflection-absorption-transmittance-reading-material-grades-6-8.pdf>

SOUND BEHAVES DIFFERENTLY ACCORDING ON THE *SURFACES* AND THEIR *FREQUENCY* CHARACTERISTICS.

*Sound creates unforgettable memories,  
reminds you to a beautiful place,  
someone you cherish,  
but also creates many problems!*

# Teori dan Penerapan **AKUSTIKA BANGUNAN**

Kursus Online Keprofesian Akustik  
By Acourete



# Online course by

Acourete

# Keprofesian Akustik - Teori dan Penerapan Akustika Bangunan

4.0 ★★★★★ (2 Rating) 16 Peserta telah mengikuti pelatihan ini

Sertifikat



Ringkasan Tanya Jawab Ulasan (1)

## Deskripsi

### 3 Manfaat Kursus

- Kursus ini membantu mengembangkan karir Anda sebagai Aplikator Profesional Akustik.
- Kursus ini membantu Anda memberikan nilai tambah Desain Akustika Bangunan yang Praktis tapi Tepat Sasaran.
- Kursus ini memberikan wawasan, teori Akustika Bangunan sampai dengan penerapannya.

### Deskripsi:

Kursus online ini berisi materi teori dan penerapan Akustika Bangunan. Kursus ini dibawakan dengan bahasa yang mudah dipahami tanpa mengurangi keutuhan teori, agar materi kursus dapat dipahami dengan baik oleh setiap peserta kursus dengan latar belakang yang berbeda.

**Kursus online ini sangat berguna bagi kalian yang berprofesi sebagai:**

1. **Konsultan perencana** atau **kontraktor** yang ingin mempelajari teori dan aplikasi akustika bangunan secara cepat dan tepat guna.
2. **Arsitek** yang ingin menambah ilmu di bidang akustik.
3. **Reseller** dan semua **partner Acourete**, untuk mengetahui lebih dalam material Acourete untuk aplikasi pada bangunan.
4. **Pelajar, mahasiswa, atau masyarakat umum** yang ingin mempelajari teori dan aplikasi praktis akustika bangunan.

**Setelah mengikuti kursus online ini, peserta akan memahami:**

1. Dampak negatif dari gangguan akustik terhadap produktivitas dan kesehatan.

Harga

Rp 1.380.000,-

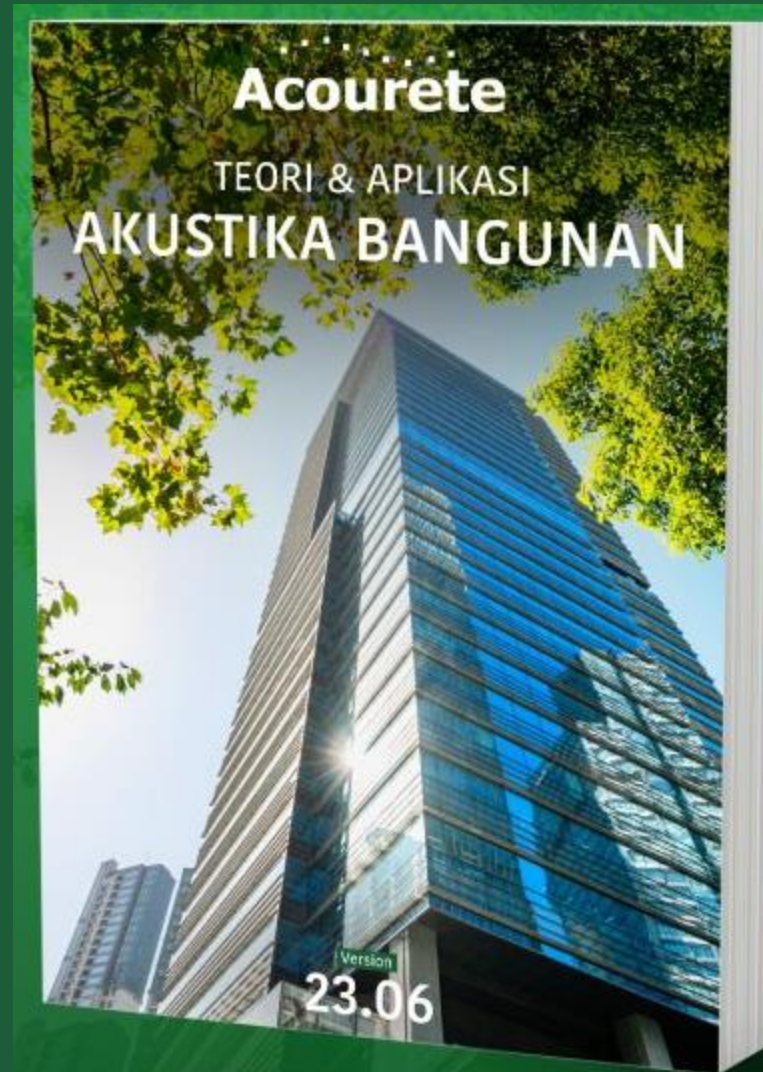
~~rp 1.380.000~~

DAFTAR PELATIHAN

Share <

Based on e-book →

 Download ebook "Teori & Aplikasi Akustika Bangunan" di <https://acourete.com/buku-akustika-bangunan-lengkap/>



**Pemateri:**

1. Retno Ajeng Pratiwi, S.Si., M.Si.

**Background pendidikan:**

S1 Fisika - Institut Teknologi Sepuluh November

S2 Fisika - Universitas Brawijaya

2. Yana Muhamadinah, S.T., M.T.

**Background pendidikan:**

S1 Teknik Fisika - Institut Teknologi Bandung

S2 Teknik Fisika - Institut Teknologi Bandung

**Penasehat:**

1. Husein Avicenna Akil: Seorang periset di Badan Riset dan Inovasi Nasional (BRIN) yang memiliki background akustik terkait dengan penyebaran suara di dalam suatu gedung terutama untuk gedung-gedung bervolume besar.

2. Tim Edukasi Acourete



# Benefit.

3 Manfaat dan harapan online course ini:

Membantu mengembangkan karir Anda sebagai Aplikator Profesional Akustik

Membantu Anda memberikan nilai tambah Desain Akustika Bangunan yang Praktis tapi Tepat Sasaran

Memberikan wawasan, teori Akustika Bangunan sampai dengan penerapannya

# Benefit.

Setelah mengikuti kursus online ini, peserta akan memahami:

Dampak negatif dari gangguan akustik terhadap produktivitas dan kesehatan.

Peraturan pemerintah atau standar akustik bangunan yang harus dicapai.

Penyebab dan jalur rambatan gangguan kebisingan pada bangunan.

Menentukan produk dan metode yang tepat atas permasalahan tersebut.

Menguasai pada tahap middle level tentang ilmu Akustika Bangunan.

# 8 Modul Pelatihan.

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BAB 0. Pengantar

BAB 1. Pengantar Akustika Bangunan

BAB 2. Dampak Kebisingan Akustika Bangunan

BAB 3. Standar Baku Kebisingan Indonesia & Internasional

BAB 4. Soundproof vs. Sound Insulation

BAB 5. Analisa Sumber Kebisingan dan Jalur Perambatannya

BAB 6. Peningkatan Performa Insulasi Akustik

BAB 7. Langkah-langkah Pembuatan Ruang Decoupling Akustik yang Bebas

Rambatan Getaran

## Konten Pelatihan

8 modul

Section 0	▼
▶ BAB 0 PENGANTAR	
📄 MATERI BAB 0 - PENGANTAR	
Section 1	▲
Section 2	▲
Section 3	▲
Section 4	▲
Section 5	▲
Section 6	▲
Section 7	▲

Section 1	▼
▶ BAB 1 Part 1 - DAMPAK POSITIF DARI KESADARAN PENTINGNYA AKUSTIKA BANGUNAN	
▶ BAB 1 Part 2 - TINGKAT TEKANAN SUARA DAN SPEKTRUM FREKUENSI	
📄 MATERI BAB 1 - PENGANTAR AKUSTIKA BANGUNAN	
📄 Evaluasi BAB 1	

Section 2	▼
▶ BAB 2 Part 1 - DEFINISI DAN DAMPAK KEBISINGAN	
▶ BAB 2 Part 2 - PERAMBATAN GELOMBANG SUARA	
▶ BAB 2 Part 3 - RAMBATAN GETARAN PADA BANGUNAN, DAMPAK NEGATIFNYA, SERTA CONTOH PENGENDALIANNYA	
📄 MATERI BAB 2 - DAMPAK KEBISINGAN AKUSTIKA BANGUNAN	
📄 Evaluasi BAB 2	

## Keynote:

- ✓ Video rekaman penjelasan materi oleh expert narasumber.
- ✓ Slide materi berbentuk PDF.
- ✓ Evaluasi dalam bentuk soal pilihan ganda pada masing-masing modul.

# Completion Certificate.



# Certificate of Completion

This certificate is proudly awarded to:

For successful completion of the course:

**“Teori dan Penerapan Akustika Bangunan”**

by Acourete

ARIEF YUDISTIRA, S.I.KOM  
Manager of Sales and Marketing Acourete

HERWIN GUNAWAN, S.T., M.T.  
Principal of Quantum Globalindo, PT

Completion Date:

Number:

# Best Deal.

~~Rp 1.380.000,-~~



Rp 300.000- / Learners

M7WDFW6IBNT9



**ENROLL  
NOW**



<https://bit.ly/AkustikaBangunanOC>

# Sound behavior and its **problem.**



# *Sound behavior and its problems*

*NOISY SPACE & ENVIRONMENTS!*



# *Sound behavior and its problems*

*NOISY SPACE & ENVIRONMENTS!*



# Sound behavior and *its problems*

TOO MUCH REVERBS, ECHOES, AND NOT SO CLEAR SPEECH

Credit: Yana M

# *Sound behavior and its problems*

*TOO MUCH REVERBS, ECHOES, AND NOT SO CLEAR SPEECH*



*To summarize, there are 3 main acoustic things we need to consider...*

*BACKGROUND  
NOISE*

*SOUND  
INSULATION*

*ROOM  
ACOUSTIC*

*NOISE FROM  
INSIDE & OUTSIDE*

*ACOUSTIC PERCEPTION &  
DEFECT INSIDE THE ROOM*

# Sound Insulation & Materials.

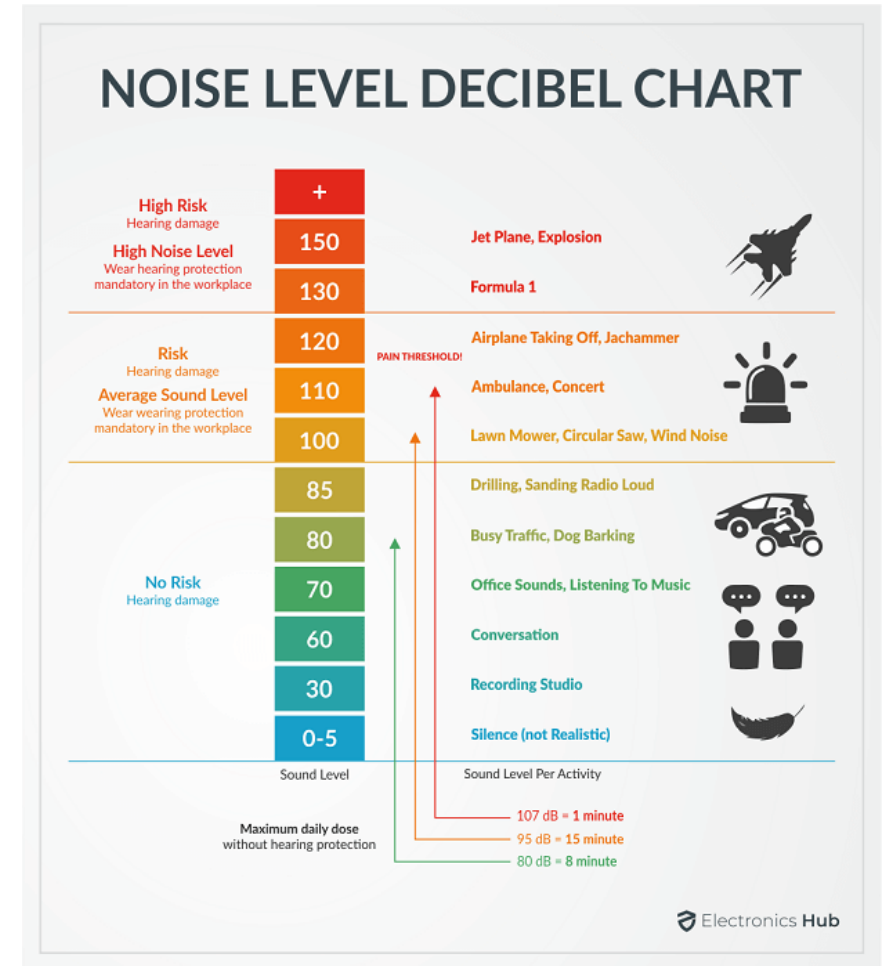
# BACKGROUND NOISE

THE AMBIENT SOUND, HOW MUCH SOUND THE MECHANICAL SERVICES PRODUCE (AC, APPLIANCES)

## PARAMETERS

- **LEQA** (SOUND PRESSURE LEVEL EQUIVALENT – A WEIGHTED)
- **NC** (NOISE CRITERIA)

Room Purpose	Parameter	Recommended Value	Reference
Ruang Konferensi, lebih dari 250 kursi	NC	35	SNI-03-6386-2000
Ruang Pertunjukan Opera & Musik	NC	30	SNI-03-6386-2000



# SOUND INSULATION

THE PROCESS TO REDUCE THE SOUND TRANSMISSION THROUGH A PARTITION OR AN OBJECT.

## PARAMETERS

- **STC** (SOUND TRANSMISSION CLASS)
- **OITC** (OUTDOOR INDOOR CLASS)
- **TL** (TRANSMISSION LOSS)
- **IL** (INSERTION LOSS)
- **IIC** (IMPACT INSULATION CLASS)

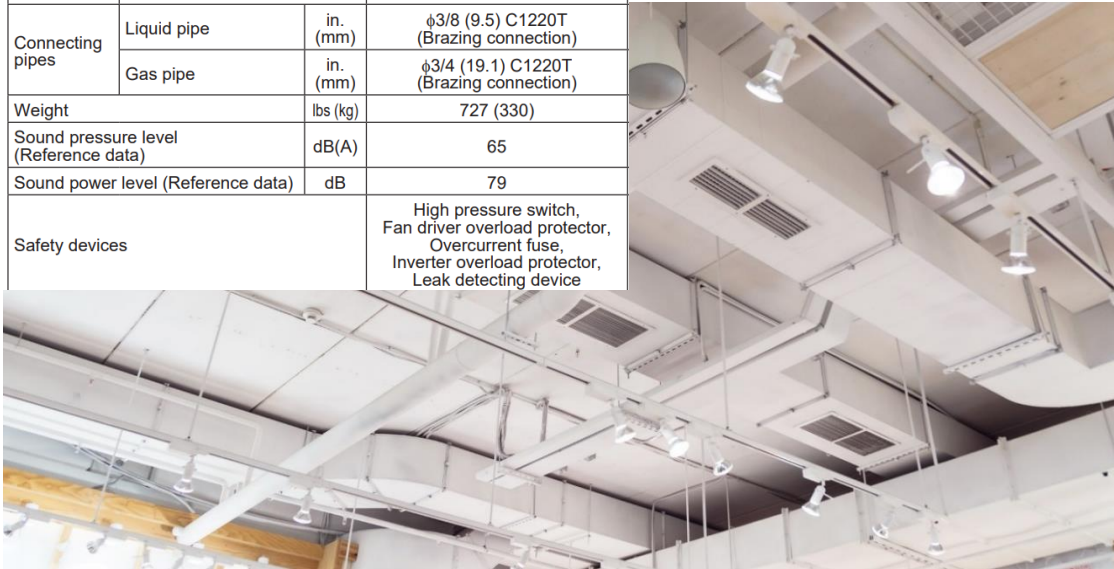
STC Rating	Privacy Afforded
25	Normal speech easily understood
30	Normal speech audible but not intelligible
35	Loud speech audible and fairly understandable
40	Loud speech audible but not intelligible
45	Loud speech barely audible
50	Shouting barely audible
55	Shouting not audible

Source: *Quieting: A Practical Guide to Noise Control*, NBS Handbook 119, National Bureau of Standards, U.S. Department of Commerce, Washington, DC, 1976



*To meet the ideal condition where the noise is minimum, we need to...*

Connecting pipes	Liquid pipe	in. (mm)	ϕ3/8 (9.5) C1220T (Brazing connection)
	Gas pipe	in. (mm)	ϕ3/4 (19.1) C1220T (Brazing connection)
Weight		lbs (kg)	727 (330)
Sound pressure level (Reference data)		dB(A)	65
Sound power level (Reference data)		dB	79
Safety devices		High pressure switch, Fan driver overload protector, Overcurrent fuse, Inverter overload protector, Leak detecting device	

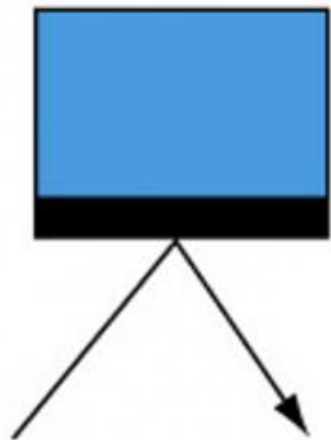


**CHOOSE THE RIGHT TYPE OF APPLIANCES AND MECHANICAL SERVICES**



**CHOOSE THE RIGHT TYPE OF PARTITION AND INSULATION TREATMENT**

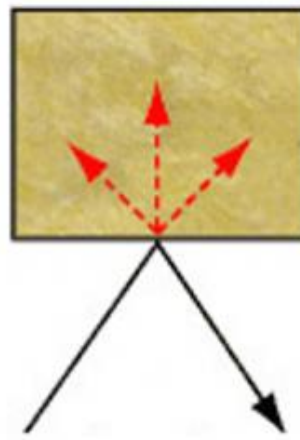
# ACOUSTIC MATERIALS



Refleksi



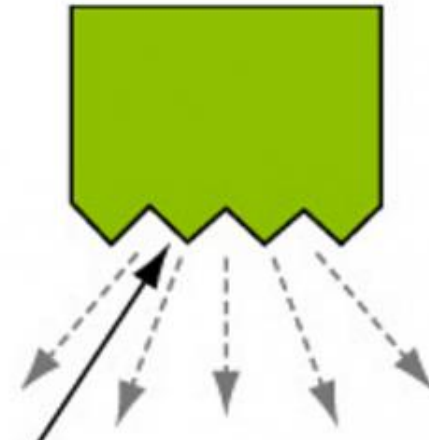
Material Insulasi



Absorpsi



Material Absorber



Difusi



Material Diffuser

*CHOOSE MATERIAL IN REGARD TO  
THEIR REACTION TO THE SOUND.*

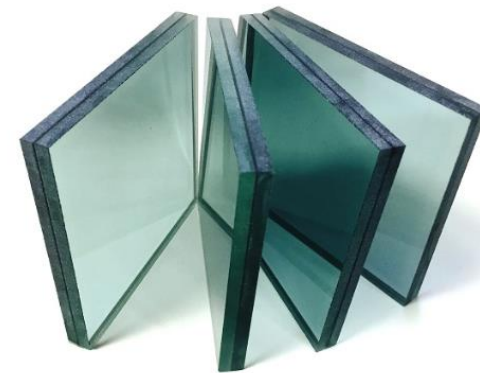
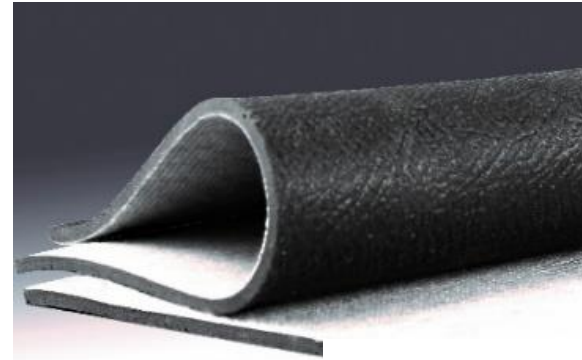
# ACOUSTIC MATERIALS - Insulation

## Material characteristics

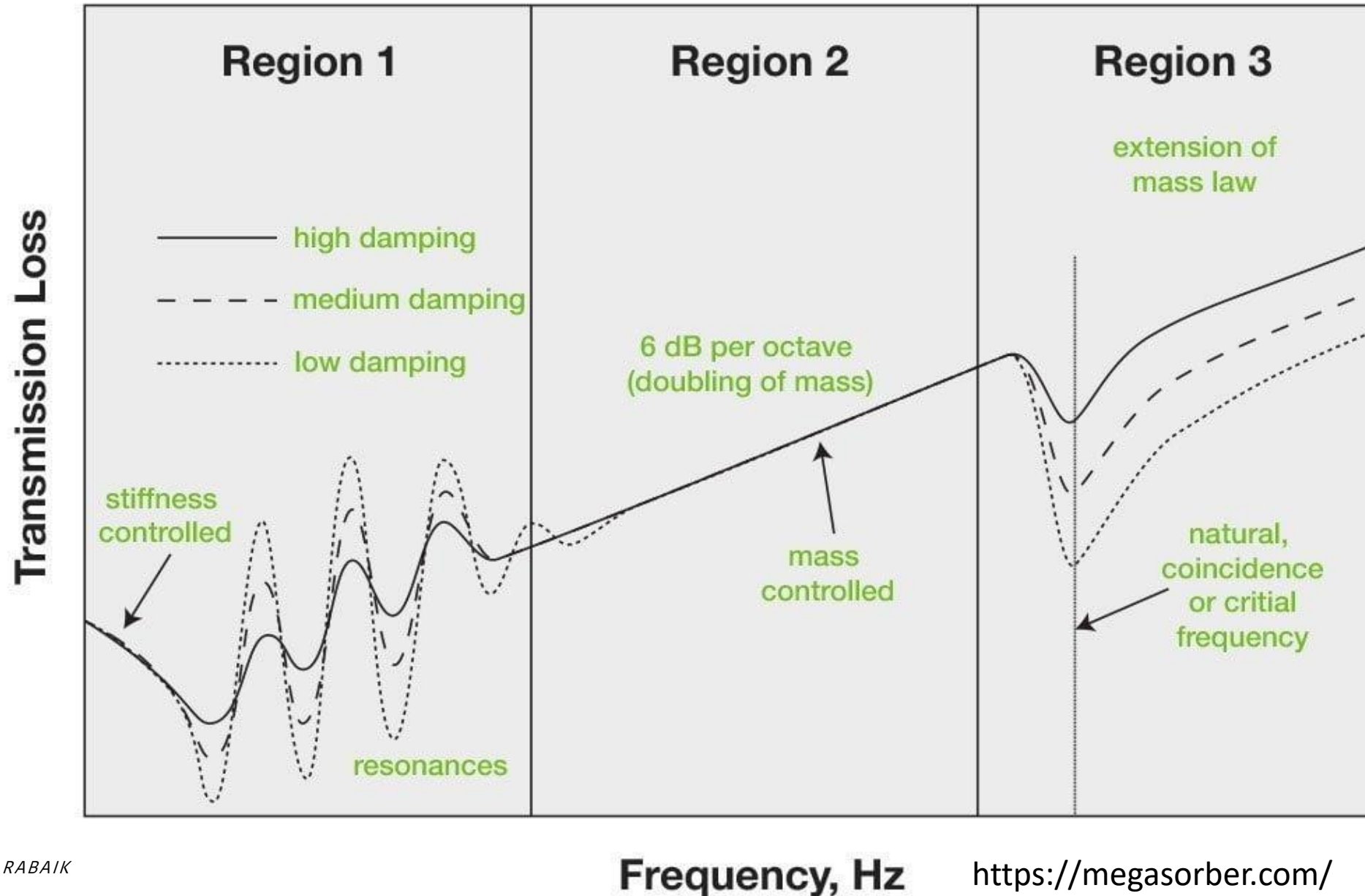
High density

High mass

Non-porous



INSULATION PERFORMANCE RATED USING **STC**  
(**SOUND TRANSMISSION CLASS**)



# ACOURETE NOISE ARMOUR

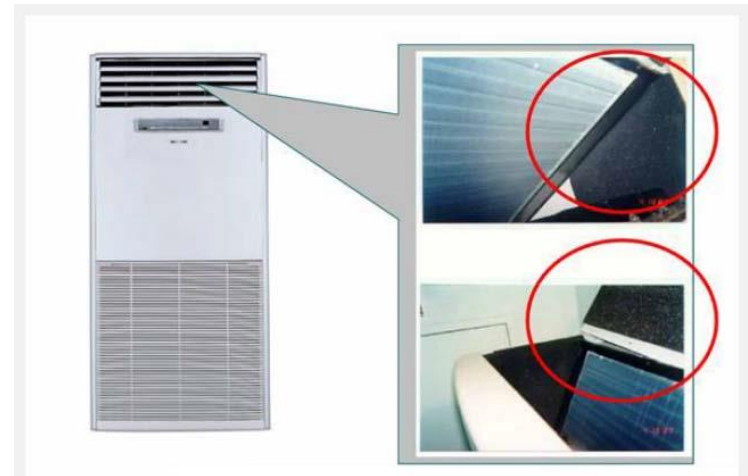
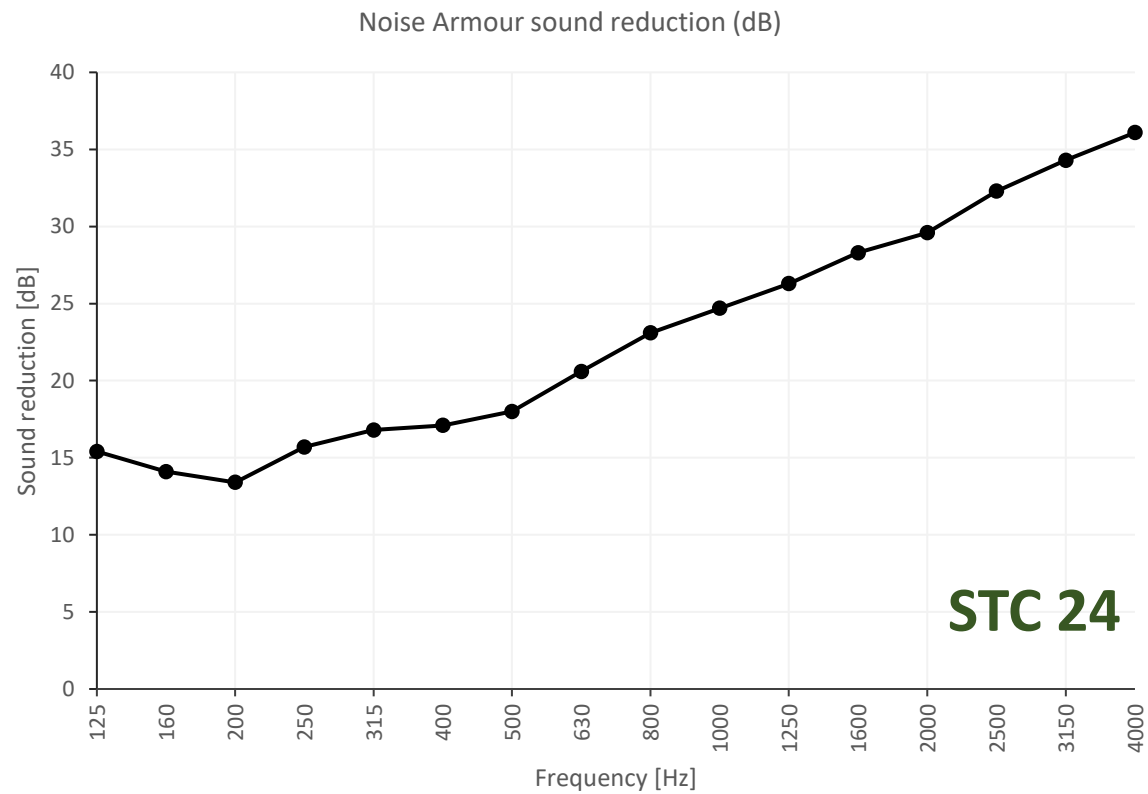


Description	Value
Type	Acoustic Vibration Insulation
Dimension	1.000 mm x 1.000 mm x 2 mm
Material	Resin
Mass	4 kg
Density	2.000 kg/m <sup>3</sup>
STC	24
Color	Black
Country of Origin	South Korea

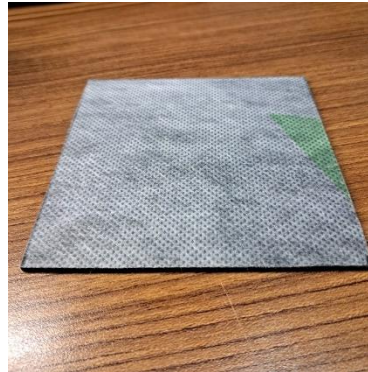
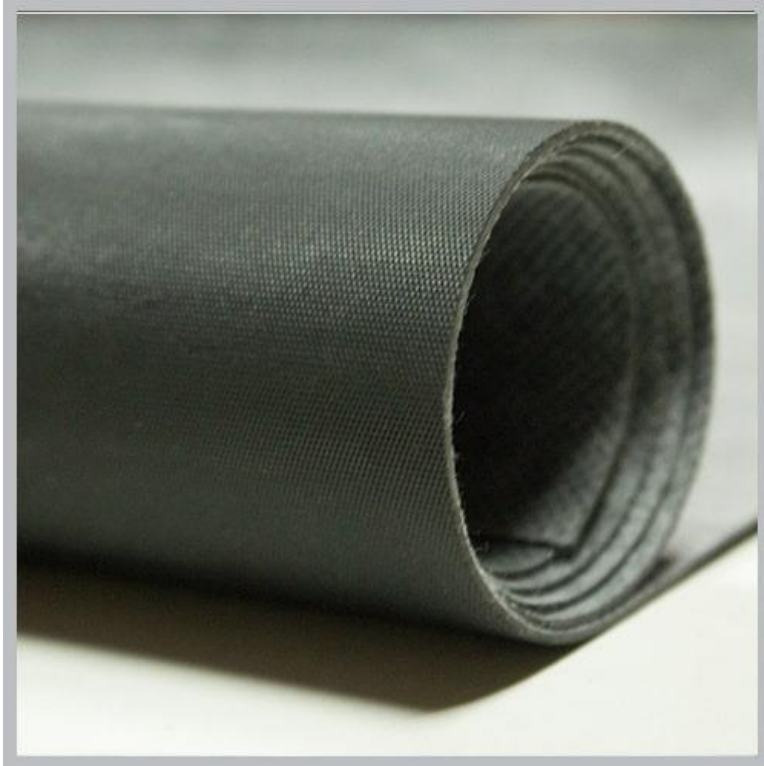
*Broadcast studio, Music recording, Home theater, Karaoke room, Auditorium, Music hall, Discotheque, Office, Machine room*

*Allergy free, toxic free, fire safety, viscoelastics*

# ACOURETE NOISE ARMOUR



# ACOURETE SILENT WALL

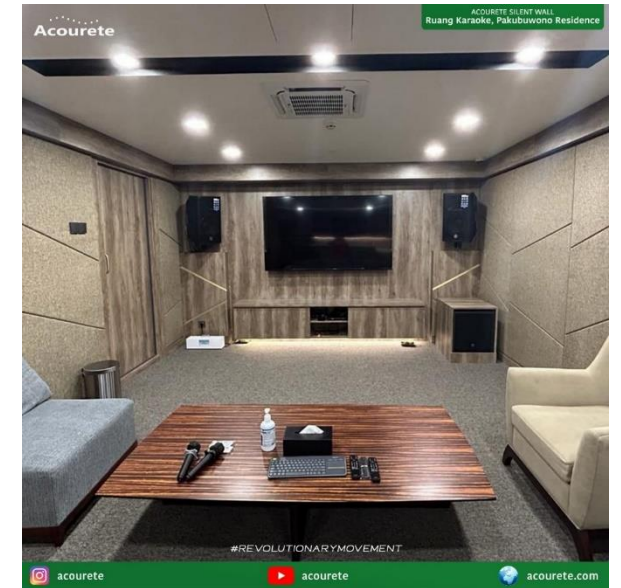
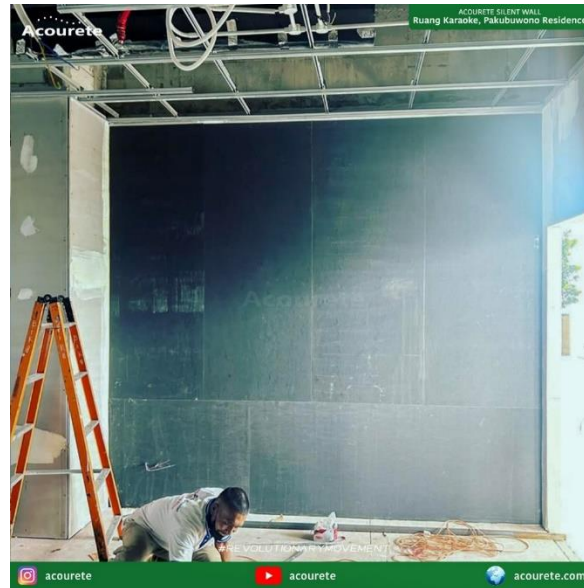
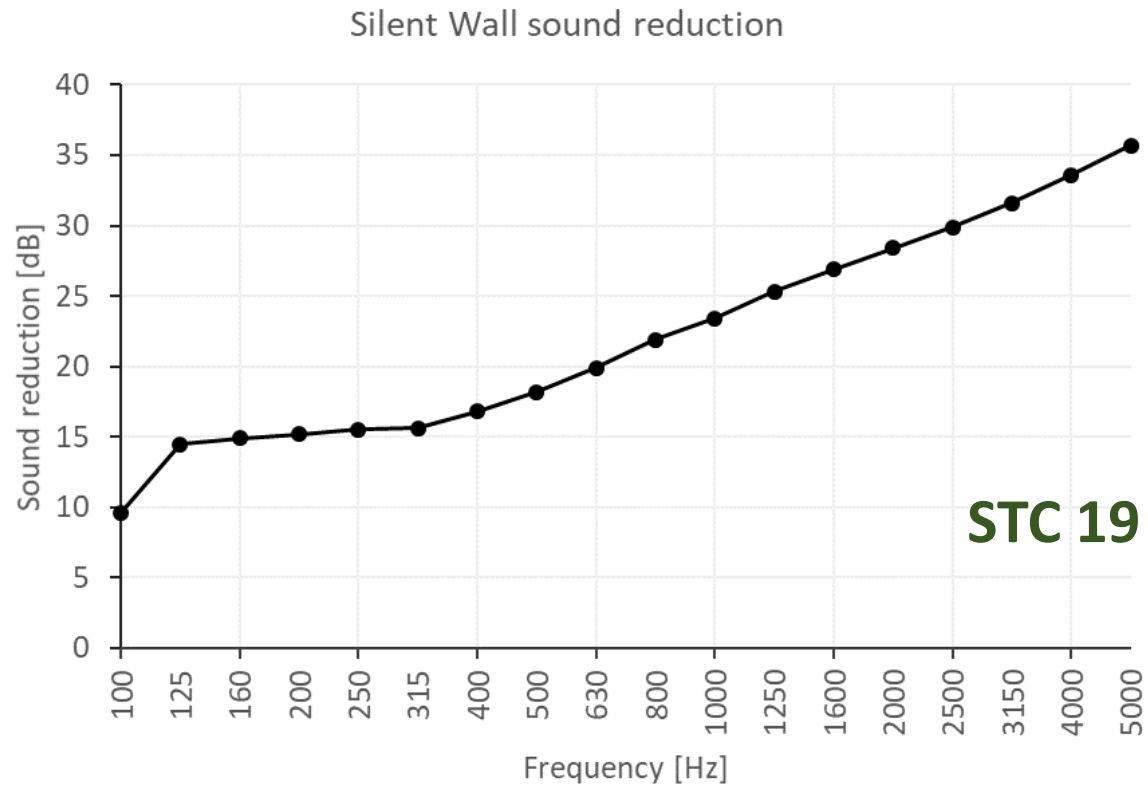


*Allergy free, toxic free, fire safety, viscoelastics*

Description	Value
Type	Acoustics Vibration Insulation
Dimension	4.880mm x 810mm x 2mm
Material	PVC
Mass	15 kg
Density	1.750 kg/m <sup>3</sup>
STC	19
Colour	Black
Country of Origin	Japan

*Broadcast studio, Music recording, Home theater, Karaoke room, Auditorium, Music hall, Discotheque, Office, Machine room*

# ACOURETE SILENT WALL





# ACOURETE FIBER



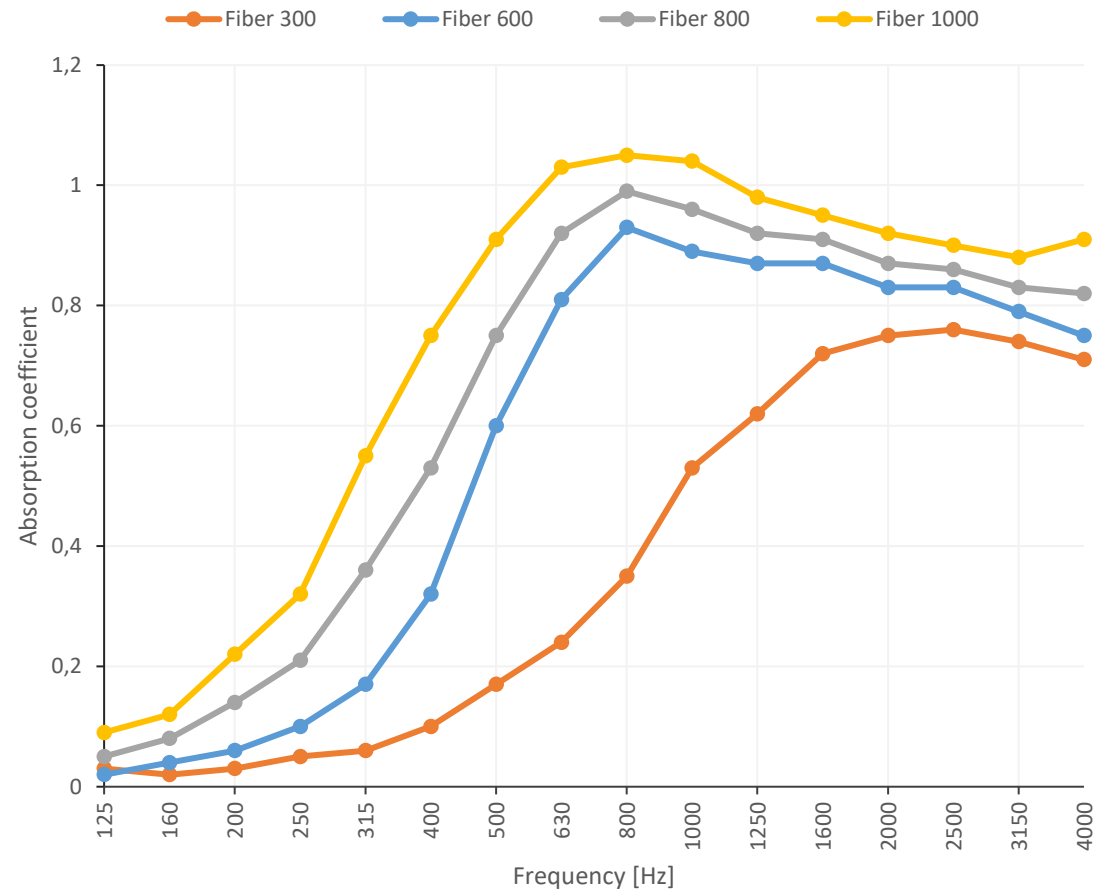
Description	Value
Type	Acoustics Absorbing Material
Dimension	Fiber 300 = 1000mm x 1500mm x 3mm Fiber 600 = 1000mm x 1500mm x 6mm Fiber 800 = 1000mm x 1500mm x 8mm Fiber 1000 = 1000mm x 1500mm x 10mm
Material	Polypropylene
Weight	Fiber 300 = 0.45 kg Fiber 600 = 0.9 kg Fiber 800 = 1.5 kg Fiber 1000 = 2.25 kg
NRC	Fiber 300 = 0.375 Fiber 600 = 0.63 Fiber 800 = 0.69 Fiber 1000 = 0.8
Density	Fiber 300 : 100 kg/m <sup>3</sup> , Fiber 600 : 100 kg/m <sup>3</sup> Fiber 800 : 125 kg/m <sup>3</sup> , Fiber 1000 : 150 kg/m <sup>3</sup>
Colour	White
Country of Origin	Korea

*Allergy free, toxic free, fire resistant*

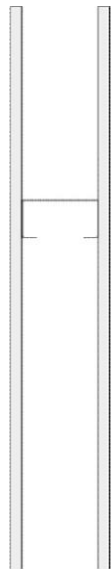
*Hall, Home theater, Karaoke room, Music lounge, Office, Hospital, Hotel*

# ACOURETE FIBER

Acourete Fiber Sound Absorption Coefficient

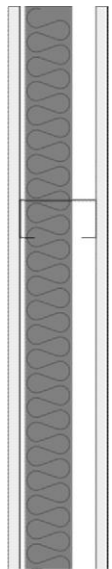


# How insulation material *reduce* the noise...



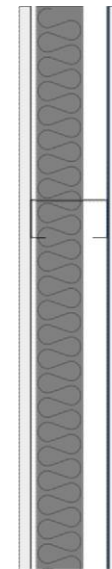
*Without  
insulation  
material*

STC 36  
OITC 23



*With insulation -  
rockwool*

STC 41  
OITC 26

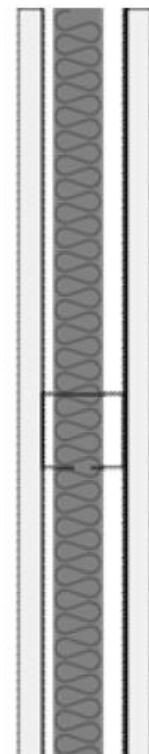
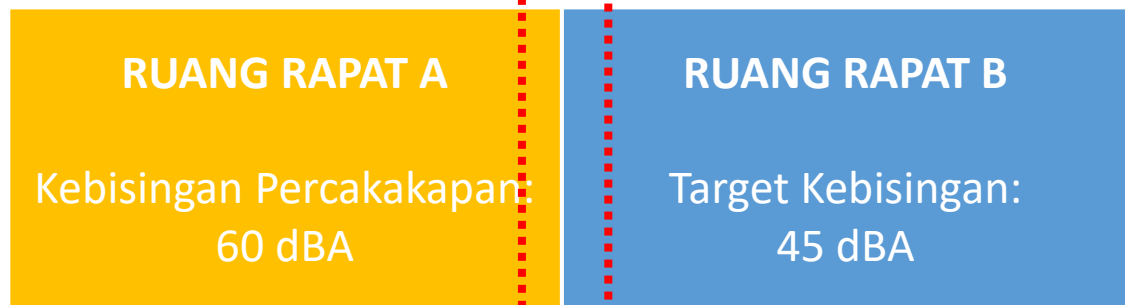


*With insulation -  
rockwool &  
Acourete Noise Armour*

STC 44  
OITC 28



## Example



**Conversation: 60 dBA**

[https://www.cdc.gov/nceh/hearing\\_loss/what\\_noises\\_cause\\_hearing\\_loss.html](https://www.cdc.gov/nceh/hearing_loss/what_noises_cause_hearing_loss.html)

[https://service.shure.com/s/article/typical-sound-pressure-levels-of-speech?language=en\\_US](https://service.shure.com/s/article/typical-sound-pressure-levels-of-speech?language=en_US)

**Target: 45 dBA**

*\*Open plan office (Table 1 Design Guidelines for HVAC-Related Background Sound in Rooms, ASHRAE Chap. 48 Noise and Vibration Control)*

**Insulasi:**

**Drywall partition STC 40**

*Example*



*FCU noise: 60 dBA*

*Target: 45 dBA*

*\*Open plan office (Table 1 Design Guidelines for HVAC-Related Background Sound in Rooms, ASHRAE Chap. 48 Noise and Vibration Control)*

*Insulasi:*

*Duct insulation soundlag pyrotek (Insertion Loss 26)*



*After insulation: 49 dBA*





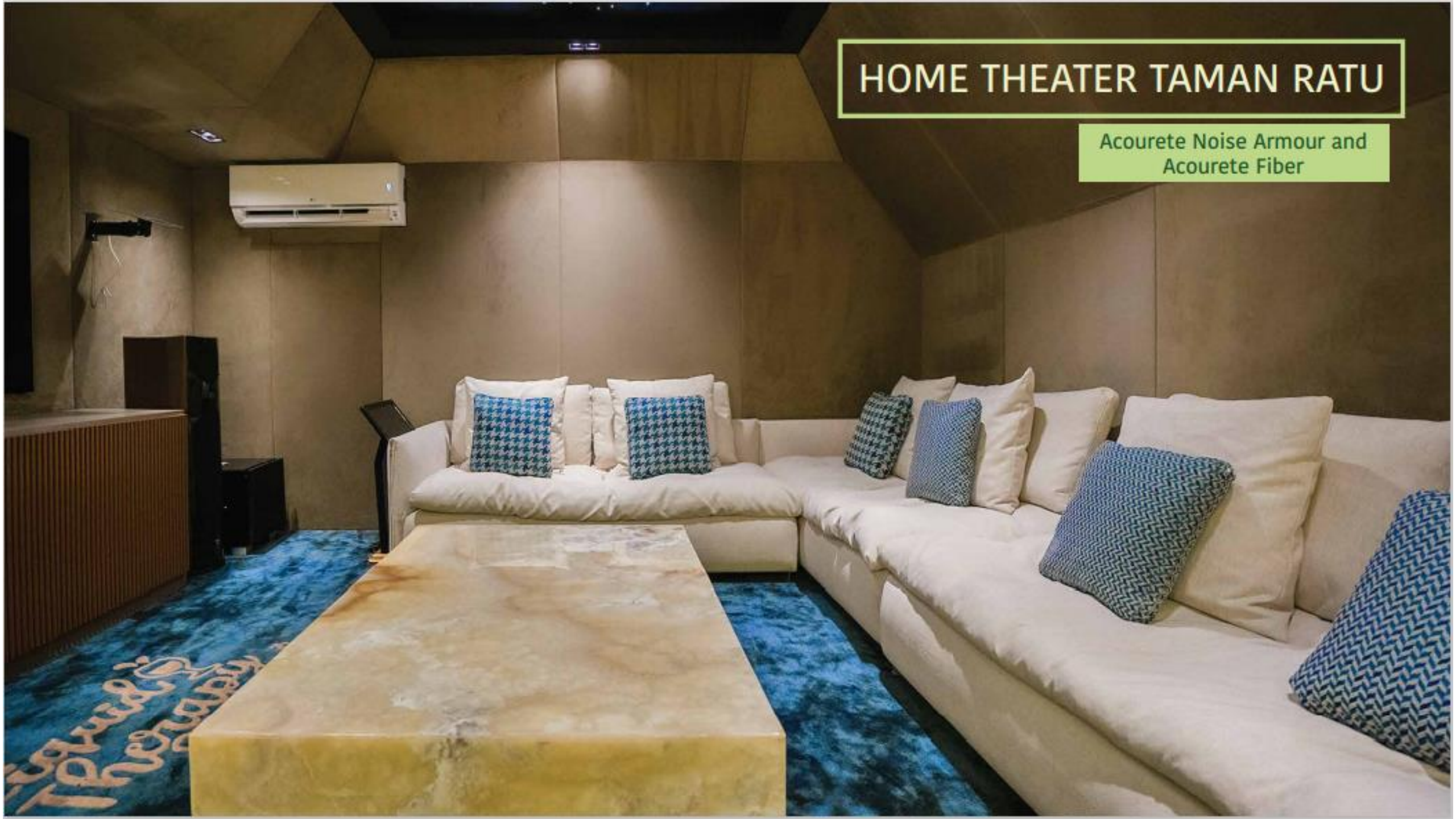




Acourete

# HOME THEATER TAMAN RATU

Acourete Noise Armour and  
Acourete Fiber



# MEETING ROOM DBS

Acourete Noise Armour

More





**ACOURETE SILENT WALL  
at Podcast Room #1 ceiling, NOICE**





**ACOURETE FIBER  
at Podcast Room #4 ceiling, NOICE**

# ACOURETE PAINT EZ1



*Allergy free, toxic free, fire resistant*

Description		Remarks
Type		Acoustics Vibration Insulation
Volume		1 litre
Viscosity (cps)		215 (no spindle 4 60rpm)
Loss Factor		0.15-0.23
Colour		Black, Water soluble damping paint
Density	Before Dry	1.3kg/m <sup>3</sup>
	After Dry	1.6kg/m <sup>3</sup>
Solid content (%)		70
Surface drying time		Over 3 hours
Complete drying time		Over 24 hours
Water resistant (After dry)		Good
Application Method		Brush, spray, roller
Country of Origin		Korea
Acourete Co.Ltd		

*Transportation, metal sheet*

# ACOURETE REGUPOL SONUS MULTI 3



*Allergy free, toxic free, cradle to cradle certified, easy to use*

Description	Value
<b>Type</b>	Vibration Damping
<b>Dimension</b>	1000mm x 1000mm x 3 mm
<b>Material</b>	PUR - Foam and Cork Elastomer
<b>Weight</b>	2,1 kg /m <sup>2</sup>
<b>Colour</b>	Brown
<b>Rolls</b>	20.000 mm x 1.000 mm
<b>Country of Origin</b>	Germany
<b>Production and Certification</b>	OHAS 18001 : 2007 , DIN ISO 9001 : 2008, DIN ISO 14001 : 2004 Managemen Sistem

*Hotel, Office, Hospital, Home theater, Music studio, Karaoke room, Gym*

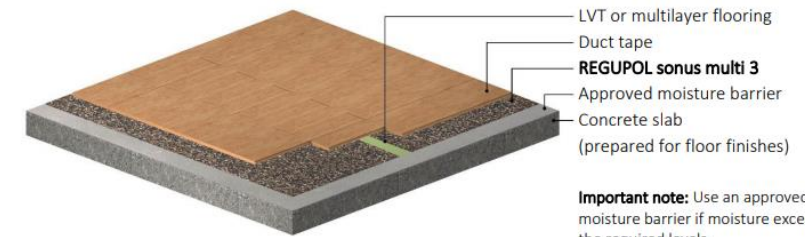
# ACOURETE REGUPOL SONUS MULTI 3

Acoustical Performance*	Standard	Result	Comment
Under vinyl planks:			
4.5 mm LVT vinyl planks, <b>REGUPOL sonus multi 3</b> , 150 mm concrete slab	AS ISO 717.2-2004 ISO 140-8: 2006 (E) ISO 140-6-2006 ASTM E989-89	$\Delta L_w$ 18 dB $L_{n,w}$ 59 dB IIC 51	Test report RG084 - INR210-04-01
4.5 mm LVT vinyl planks (non-bonded), <b>REGUPOL sonus multi 3</b> (non-bonded), 150 mm concrete slab	AS ISO 717.2-2004 ISO 140-8: 2006 (E) ISO 140-6-2006 ASTM E989-89	$\Delta L_w$ 19 dB $L_{n,w}$ 58 dB IIC 52	Test report RG081 – INR210-01-01
2 mm vinyl planks, <b>REGUPOL sonus multi 3</b> , 150 mm concrete slab	AS ISO 717.2-2004 ISO 140-8: 1997 (E) ISO 140-6 ASTM E989-89	$\Delta L_w$ 18 dB $L_{n,w}$ 58 dB IIC 52	Test report RG019 - INR153 Test Floor (a)
Under sheet vinyl:			
2 mm sheet vinyl, <b>REGUPOL sonus multi 3</b> , 150 mm concrete slab	AS ISO 717.2-2004 ISO 140-8: 2006 (E) ISO 140-6-2006 ASTM E989-89	$\Delta L_w$ 17 dB $L_{n,w}$ 61 dB IIC 49	Test report RG082 – INR210-08-02

\*Assembly from top to bottom

## Floor assembly example

Non-bonded LVT or multilayer modular flooring



**Important note:** Use an approved moisture barrier if moisture exceeds the required levels.



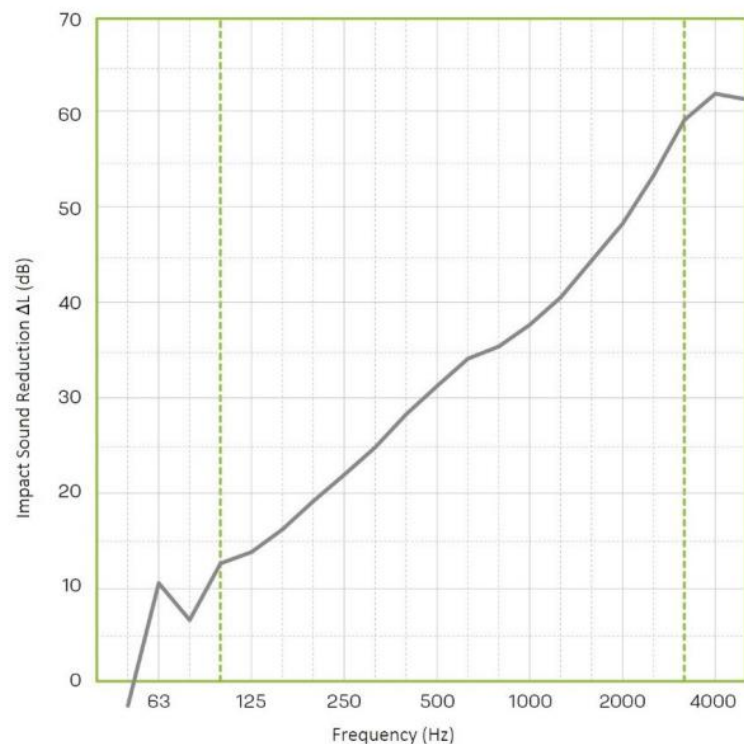




# ACOURETE REGUPOL SOUND 12

## Detailed test results for impact sound reduction

Test report PB 4.2/14-154-2



### Assembly

90 mm Cement screed

CT-C25-F4, 160 kg/m<sup>2</sup>

**17 mm REGUPOL sound 12**

140 mm Concrete Slab

### Test room size

4.86 x 5.06 m = 24.60 m<sup>2</sup>

Publication of test results by MFPA

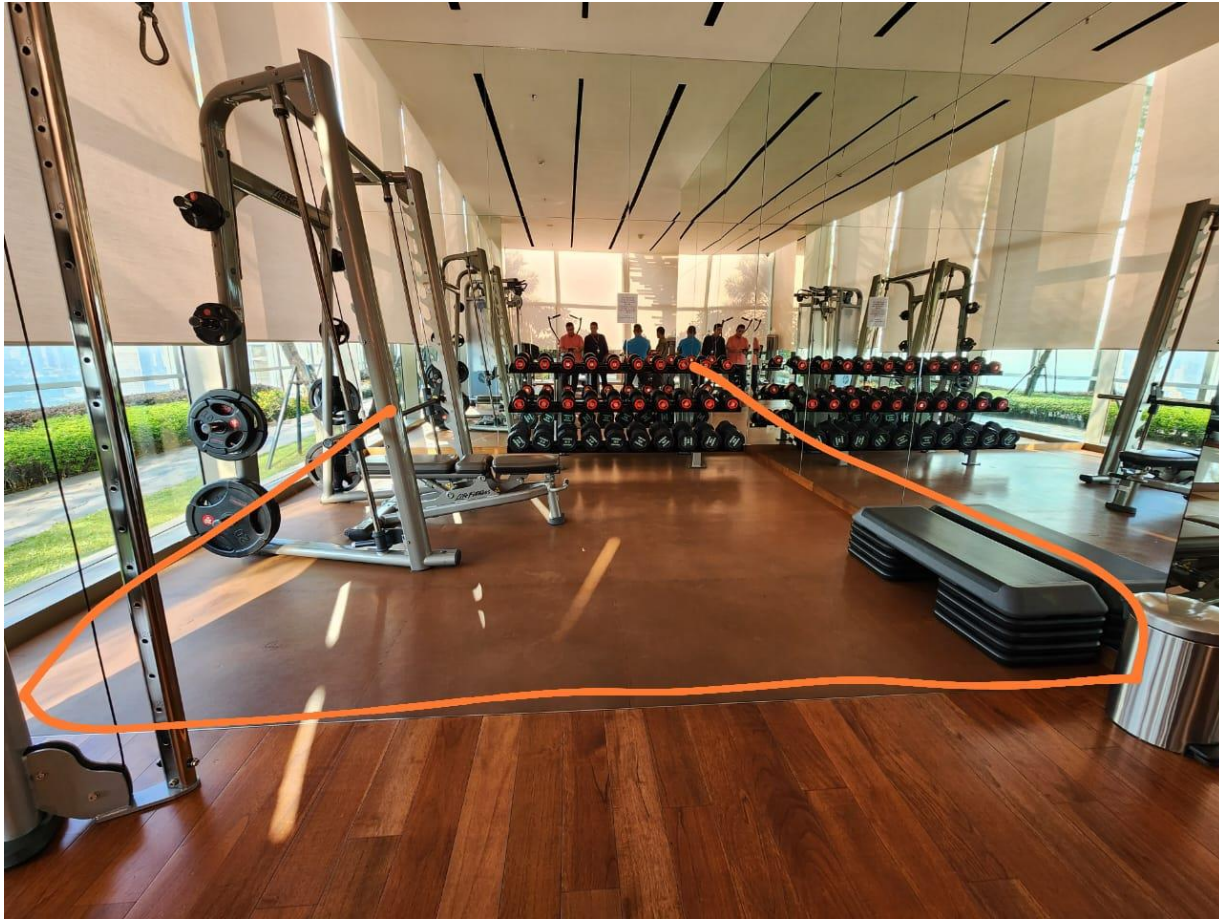
Leipzig GmbH.

The full test report PB4.2/14-154-2 dtd.

17/07/2014 is available upon request.



# ACOURETE REGUPOL SOUND 12



# ACOURETE REGUFOAM VIBRATION 150



*Allergy free, toxic free, low natural frequency*

Description	Value
Type	Vibration Damping Foam
Dimension	1000mm x 1500mm x 12mm
Material	Cellular Polyurethane
Weight	+/- 2.5 kg/m
Density	150 kg/m <sup>3</sup>
Colour	Beige
Country of Origin	Germany

*Broadcast studio, Home theater, Karaoke room, Music hall, Discotheque, Railroads, Machines, Building foundation*

# ACOURETE REGUFOAM VIBRATION 150

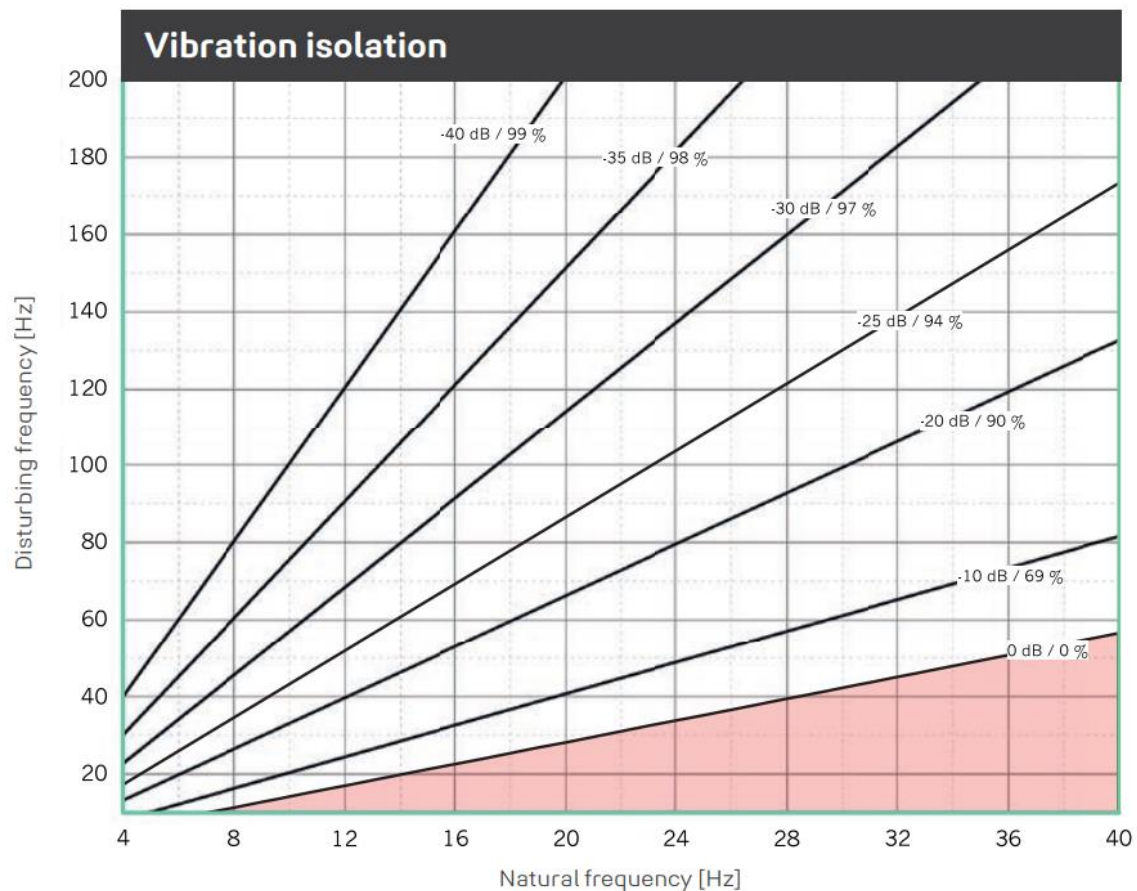
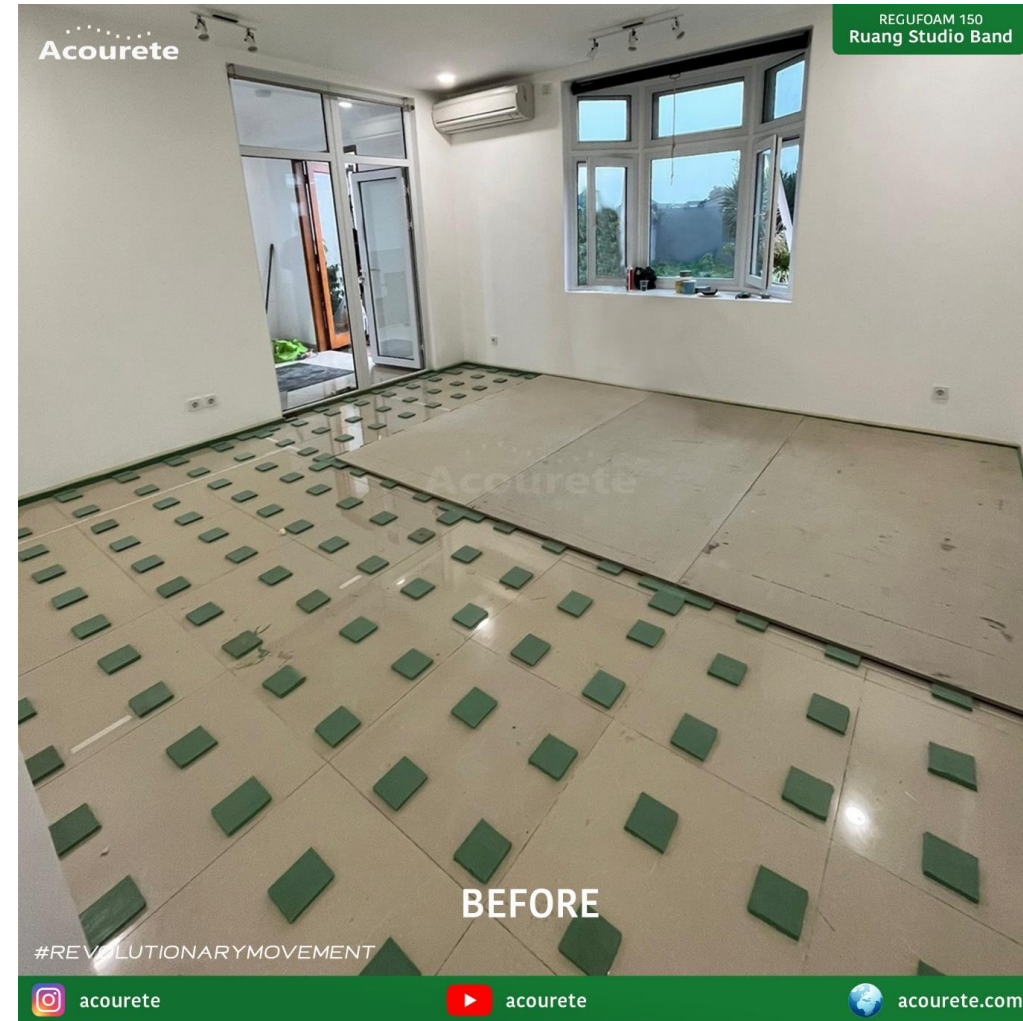


Illustration of the isolation efficiency of a single-degree-of-freedom system (SDOF system) on a rigid base with **REGUFOAM vibration 150plus**. Parameter: power transmission (insertion loss) in dB, isolation factor in %.



# ACOURETE REGUPOL VIBRATION 300

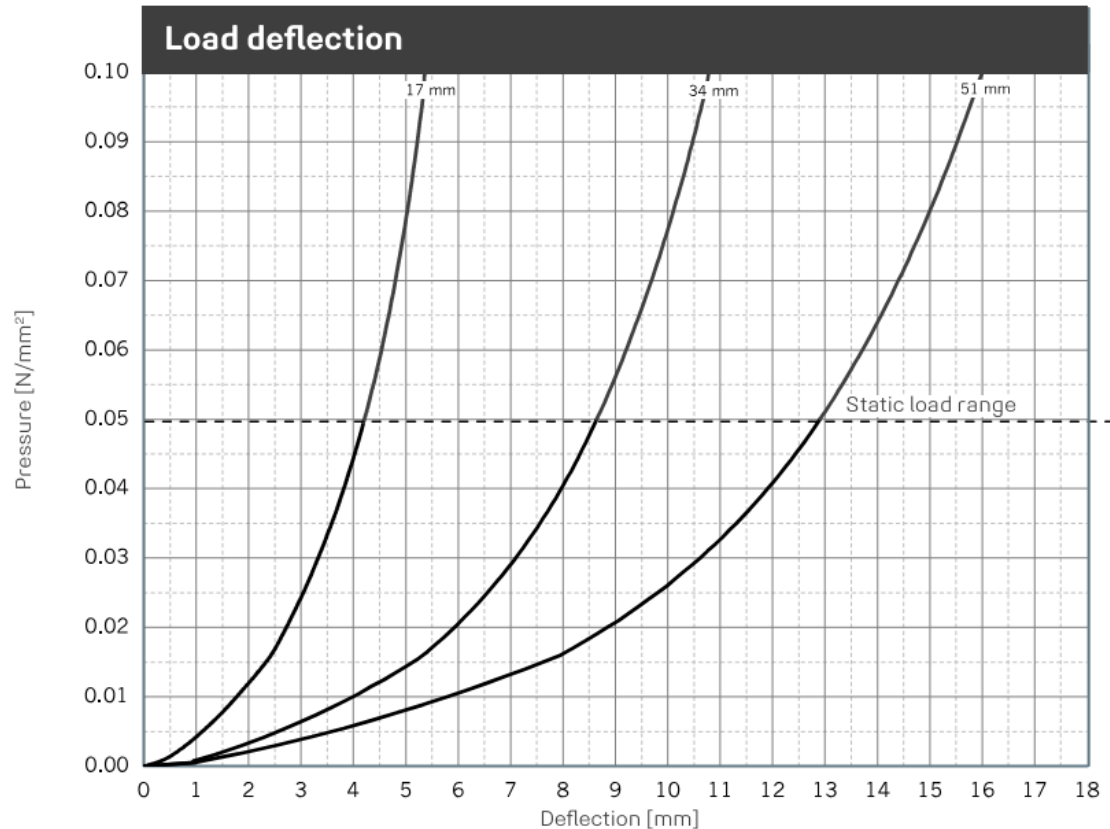


*Low natural frequency, long-lasting, cradle to cradle certified*

Description	Value
<b>Material</b>	Rubber, Fibres, Styrene-butadiene rubber (SBR), Nitrile butadiene rubber (NBR) Polyurethane
<b>Loss factor</b>	0.18
<b>Compression Set</b>	4.1 %
<b>Elongation at Break</b>	60%
<b>Fire Behaviour</b>	B2 ( DIN4102 )
<b>Dimension</b>	1000mm x 1250mm x 17mm
<b>Colour</b>	Black
<b>Permanent Static Load</b>	5.000kg/m <sup>2</sup>
<b>Country of Origin</b>	Germany

*Factory machine, Generator, Hotel, Apartment, Office, Public transportation, Railway, Trailer truck, Subway, Chiller machine*

# ACOURETE REGUPOL VIBRATION 300



Examination of deflection in accordance to DIN EN 826 between two stiff panels. Illustration based on the third loading. Velocity of loading and unloading 20 seconds. Tested at room temperature. Dimensions of test specimens 300 x 300 mm.

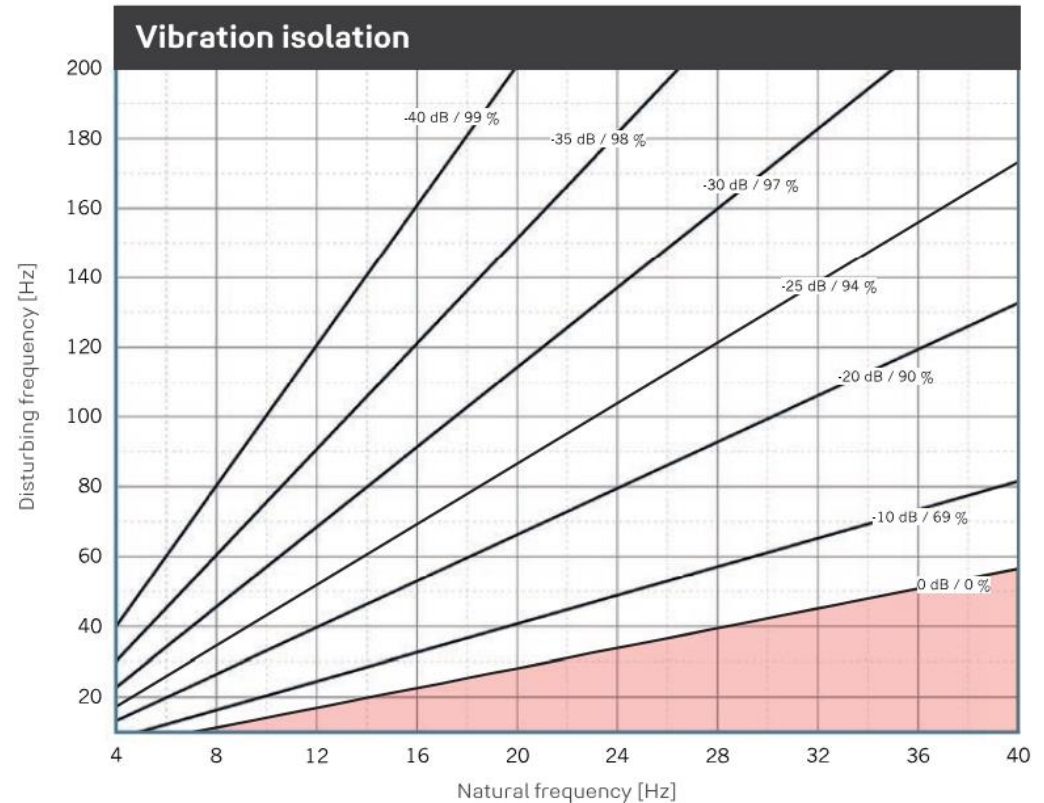


Illustration of the isolation efficiency of a single-degree-of-freedom system (SDOF system) on a rigid base with **REGUPOL vibration 300**. Parameter: power transmission (insertion loss) in dB, isolation factor in %.

# ACOURETE REGUPOL VIBRATION 300



1 tiles or other floor coverings • 2 glue • 3 screed • 4 PE foil • 5 **Regupol®** or **Regufoam®** screed insulation • 6 raw ceiling • 7 perimeter insulation strips made of **Regupol®**, **Regufoam®** or another material





# Room Acoustic & Materials.

# *ROOM ACOUSTIC*

*THE SOUND PERCEPTION INSIDE THE ROOM. HOW THE SOUND BOUNCES AROUND WITHIN SPACE AND REFLECTED FROM THE SURFACES.*

*IS THERE ANY DEFECT?*

## *PARAMETERS*

- *RT (REVERBERATION TIME)*
- *D50, C80 (CLARITY)*
- *STI (SOUND TRANSMISSION INDEX)*
- *LF (LATERAL FRACTION)*
- *BR (BASS RATIO)*

# *What can influence the room acoustic?*

*VOLUME*

*BUILDING'S  
GEOMETRI  
(SHAPE)*

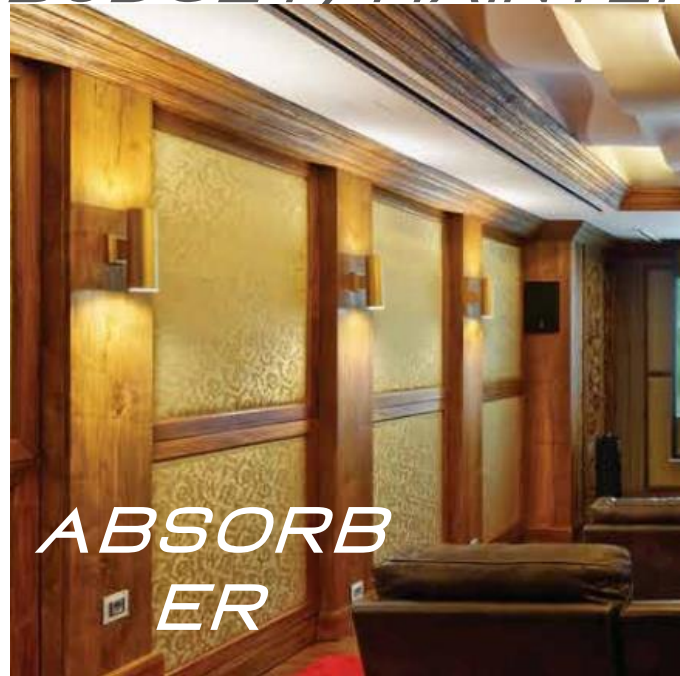
*INTERIOR  
SURFACES'S  
SHAPE*

*FINISHING  
MATERIAL*

# What can *influence* the room acoustic?

## FINISHING MATERIAL

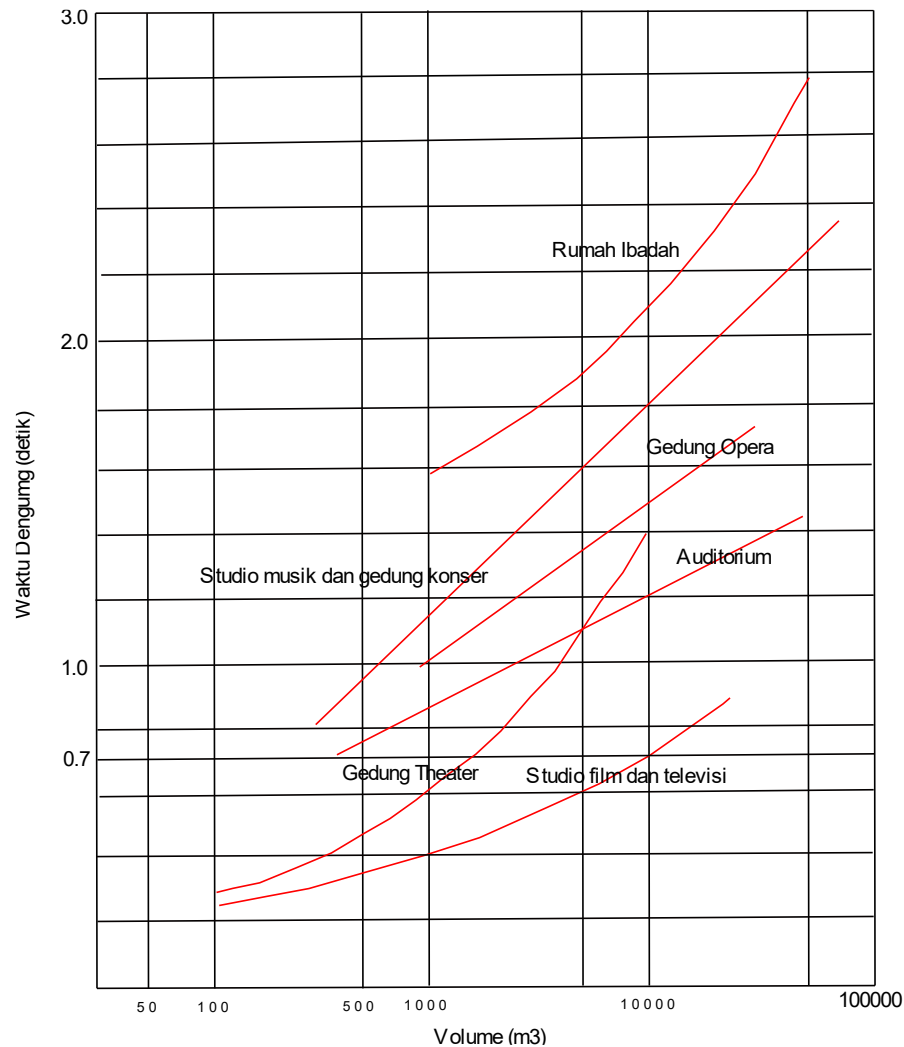
THE DESIGNED INTERIOR OR OWNER'S TASTE,  
BUDGET, MAINTENANCE, DURABILITY



# The ideal condition where the room acoustic is optimum...

## NO DEFECT!

- SOUND DISTRIBUTED EQUALLY
- NO TOO MUCH REVERB,
- NO ECHO, FLUTTER ECHO, SOUND FOCI



Reverberation Time  
SNI-03-6386-2000

# The ideal condition where the room acoustic is optimum...

## D50, C80 (ISO 3382-1)

Table A.1 — Acoustic quantities grouped according to listener aspects

Subjective listener aspect	Acoustic quantity	Single number frequency averaging <sup>a</sup> Hz	Just noticeable difference (JND)	Typical range <sup>b</sup>
Subjective level of sound	Sound strength, $G$ , in decibels	500 to 1 000	1 dB	-2 dB; +10 dB
Perceived reverberance	Early decay time (EDT) in seconds	500 to 1 000	Rel. 5 %	1,0 s; 3,0 s
Perceived clarity of sound	Clarity, $C_{80}$ , in decibels	500 to 1 000	1 dB	-5 dB; +5 dB
	Definition, $D_{50}$	500 to 1 000	0,05	0,3; 0,7
	Centre time, $T_S$ , in milliseconds	500 to 1 000	10 ms	60 ms; 260 ms
Apparent source width (ASW)	Early lateral energy fraction, $J_{LF}$ or $J_{LFC}$	125 to 1 000	0,05	0,05; 0,35
Listener envelopment (LEV)	Late lateral sound level, $L_J$ , in decibels	125 to 1 000	Not known	-14 dB; +1 dB

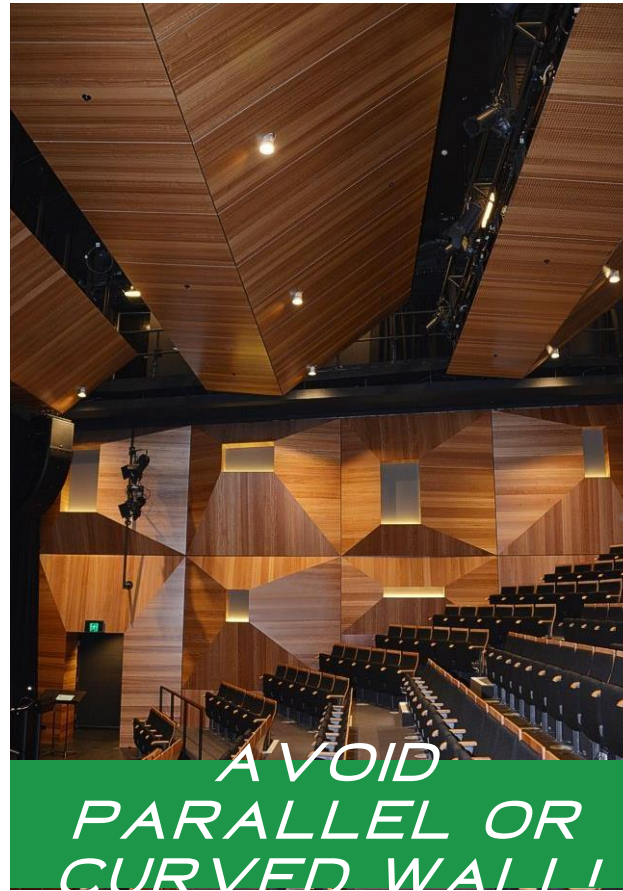
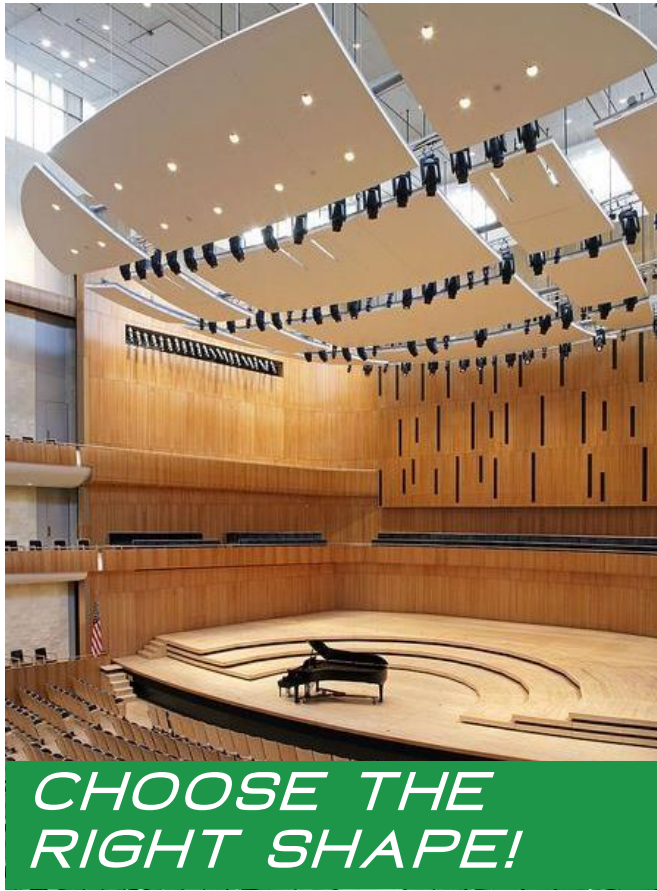
<sup>a</sup> The single number frequency averaging denotes the arithmetical average for the octave bands, except for  $L_J$  which shall be energy averaged [see (A.17)].

<sup>b</sup> Frequency-averaged values in single positions in non-occupied concert and multi-purpose halls up to 25 000 m<sup>3</sup>.

## STI (IEC 60268-16)

Band	STI Range	Examples of typical uses
A+	> 0.76	Recording studios
A	0.74 - 0.76	Theatres, speech auditoria, parliaments, courts
B	0.70 - 0.74	Theatres, speech auditoria, parliaments, courts
C	0.66 - 0.70	Teleconference, theatres
D	0.62 - 0.66	Classrooms, concert halls
E	0.58 - 0.62	Concert halls, modern churches
F	0.54 - 0.58	PA in shopping malls, public offices, cathedrals
G	0.50 - 0.54	PA in shopping malls, public offices
H	0.46 - 0.50	PA in difficult acoustic environments
I	0.42 - 0.46	PA in very difficult spaces
J	0.38 - 0.42	Not suitable for PA systems
U	< 0.36	Not suitable for PA systems

*To meet the ideal condition where the room acoustic is optimum...*



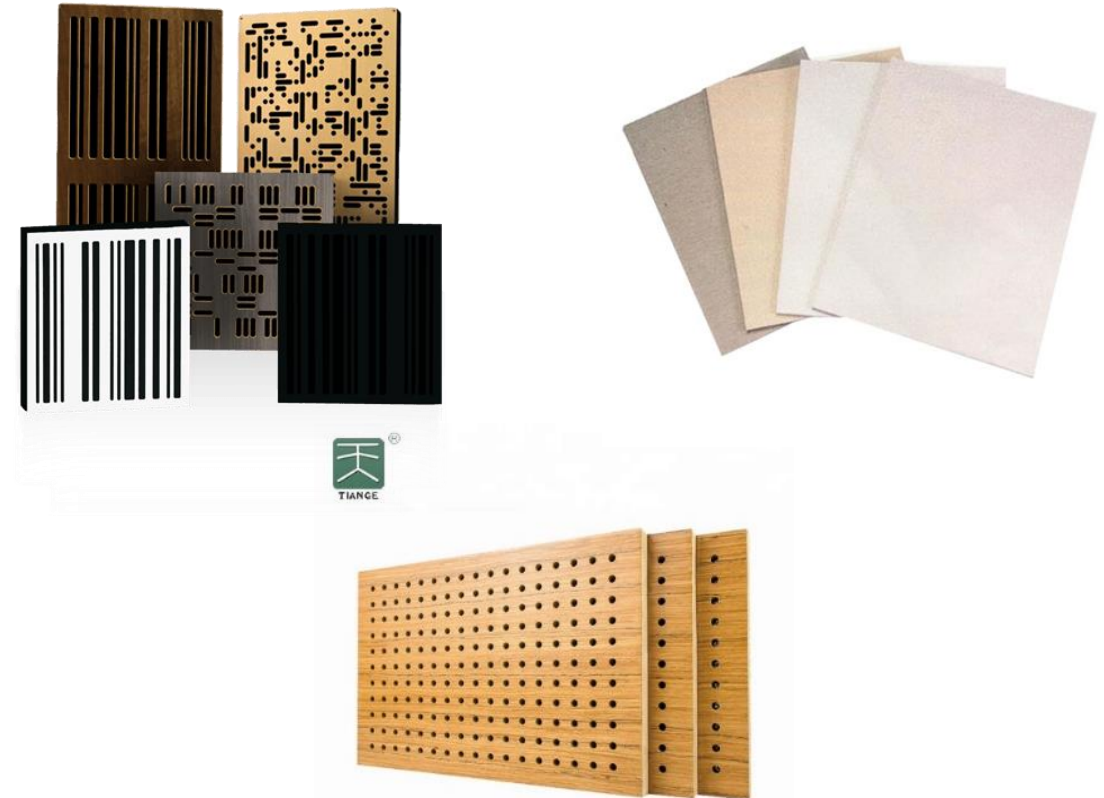
# ACOUSTIC MATERIAL - Absorption

## Material characteristics

Low density

Low mass

Porous



ABSORPTION PERFORMANCE RATED USING **NRC**  
(**NOISE REDUCTION COEFFICIENT**)





Before Treatment

Suara Ucap	Choir	Musik



After Treatment

Suara Ucap	Choir	Musik

# How room acoustics treatment improve the sound

## DESAIN A

Ruangan tanpa diberikan material peredam suara sama sekali

Volume Ruang : 287,88 m<sup>3</sup>

Luas Permukaan : 400,38 m<sup>2</sup>

RT60 : 1,66 detik

C80 : -0,38 dB

LF : 0,26

STI : 0,510



Tanpa peredam suara

## DESAIN B

Ruangan diberikan sedikit material peredam suara

Volume Ruang : 287,88 m<sup>3</sup>

Luas Permukaan : 400,38 m<sup>2</sup>

RT60 : 1,32 detik

C80 : 9,60 dB

LF : 0,25

STI : 0,566



Penambahan peredam suara 10%  
dari total luas permukaan ruang.

## DESAIN C

Ruangan diberikan material peredam suara cukup banyak

Volume Ruang : 287,88 m<sup>3</sup>

Luas Permukaan : 400,38 m<sup>2</sup>

RT60 : 0,50 detik

C80 : 9,60 dB

LF : 0,19

STI : 0,749



Penambahan peredam suara 40%  
dari total luas permukaan ruang.

# ACOURETE FIBER



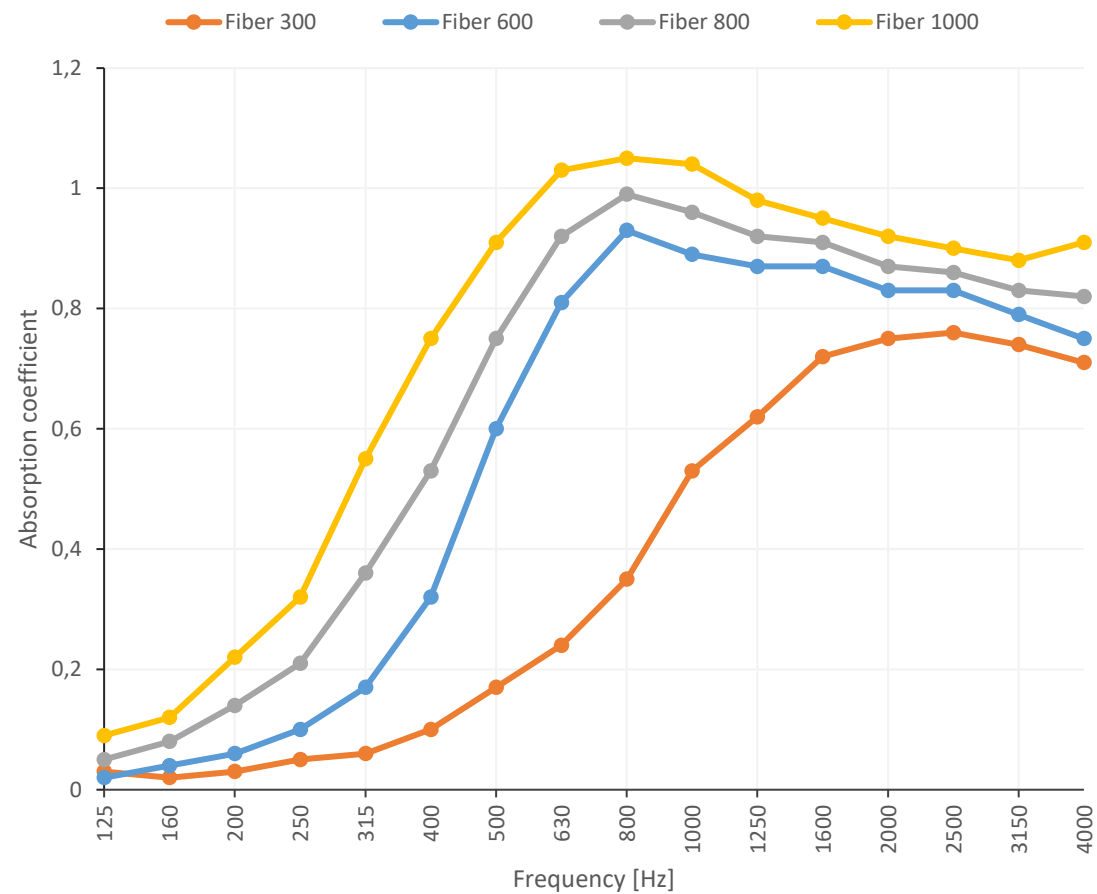
*Allergy free, toxic free, fire resistant*


Description	Value
Type	Acoustics Absorbing Material
Dimension	Fiber 300 = 1000mm x 1500mm x 3mm Fiber 600 = 1000mm x 1500mm x 6mm Fiber 800 = 1000mm x 1500mm x 8mm Fiber 1000 = 1000mm x 1500mm x 10mm
Material	Polypropylene
Weight	Fiber 300 = 0.45 kg Fiber 600 = 0.9 kg Fiber 800 = 1.5 kg Fiber 1000 = 2.25 kg
NRC	Fiber 300 = 0.375 Fiber 600 = 0.63 Fiber 800 = 0.69 Fiber 1000 = 0.8
Density	Fiber 300 : 100 kg/m <sup>3</sup> , Fiber 600 : 100 kg/m <sup>3</sup> Fiber 800 : 125 kg/m <sup>3</sup> , Fiber 1000 : 150 kg/m <sup>3</sup>
Colour	White
Country of Origin	Korea

*Hall, Home theater, Karaoke room, Music lounge, Office, Hospital, Hotel*

# ACOURETE FIBER

Acourete Fiber Sound Absorption Coefficient



A wide-angle photograph of a modern canteen. The room features a light-colored wood-look floor and a ceiling with exposed ductwork and track lighting. In the foreground, several square wooden tables are arranged with matching wooden chairs that have blue upholstered seats. To the right, there is a long, low blue upholstered booth with small round tables. In the background, a kitchen area with wooden cabinetry and stainless steel appliances is visible. A green exit sign is mounted on a glass door in the distance.

**ACOURETE FIBER**  
**at Canteen – Pharmacy Office**

**ACOURETE FIBER  
at Jatinegara Music Studio**



**ACOURETE FIBER**  
**at Audiophile Room, Sindanglaya**



**ACOURETE FIBER  
at Family Home Theatre, HALLING**





# ACOURETE BOARD 230



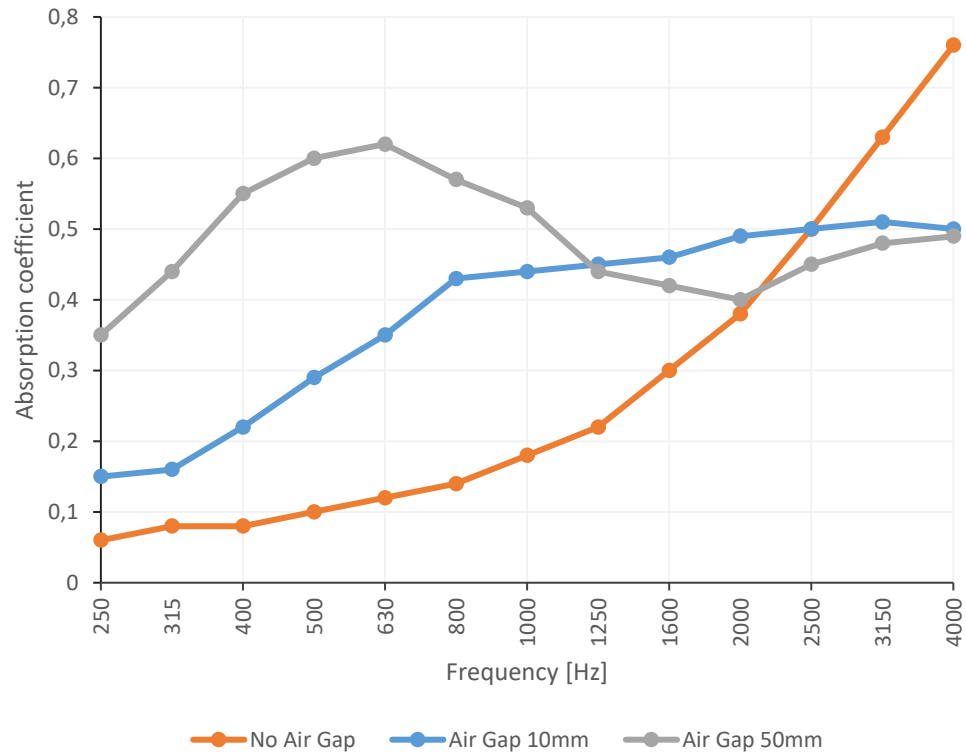
*Allergy free, toxic free, fire resistant*

Description	Value
Type	Acoustics Board Ceiling Wall
Dimension	1200mm x 600mm x 9mm
Material	Polyester
Density	230 g/m <sup>3</sup>
Weight	1.5 kg
NRC	0.47
Colour	White
Country of Origin	Korea

*Hall, Home theater, Karaoke room, Music lounge, Office, Hospital, Hotel*

# ACOURETE BOARD 230

Acourete Board Sound Absorption Coefficient





# DIAMOND GOLF HOUSE

Acourete Board

**ACOURETE BOARD 230  
at Aula Sekolah Pangudi Luhur,  
Van Lith, Muntilan**



# ACOURETE PERFOWOOD



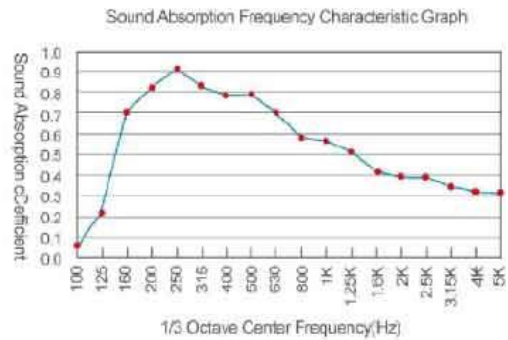
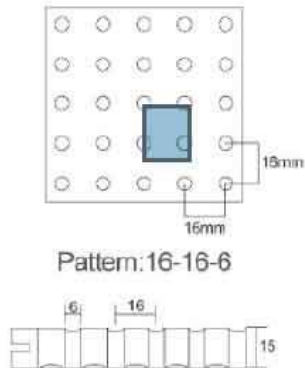
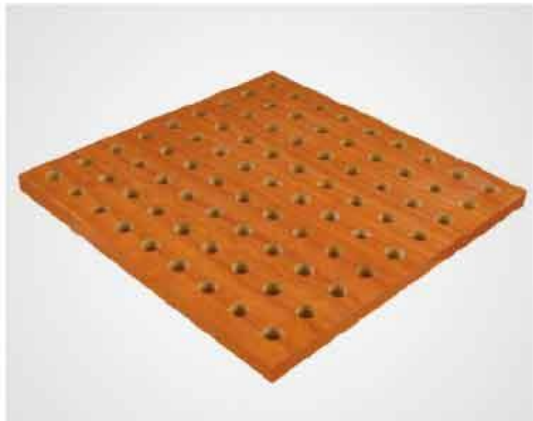
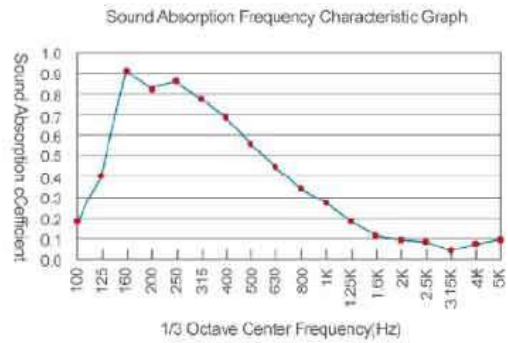
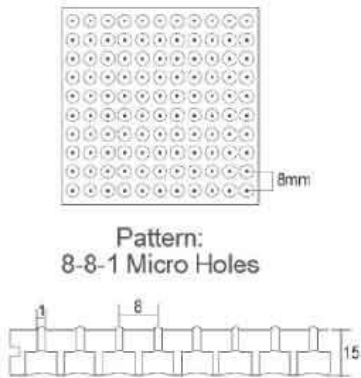
*Hall, Home theater, Karaoke room, Music lounge, Auditorium, Worship house*

#MENUJUSUARABAIK

WWW.ACOURETE.COM

Description	Value
Surface Density	8.5 kg/m <sup>3</sup>
Material	MDF
Front Finish	Melamine
Back Finish	Unfinish + Acoustics Felt
Length	1200mm / 600mm
Width	600mm
Thickness	12mm
Fire Rating	No
Eco Friendly	No
Color	See Color Table
NRC Perfowood 881	0.44
NRC Perfowood 16166	0.66
Country of Origin	China

# ACOURETE PERFOWOOD



**ACOURETE PERFOWOOD  
at Keuskupan Agung, Palangkaraya**



**ACOURETE PERWOOD  
at Papillon Restaurant**





**ACOURETE PERWOOD  
at Auditorium Plaza Mandiri**



Credit:  
<https://www.sbm.itb.ac.id/about/labtekxix/>



*Adjustable acoustics*

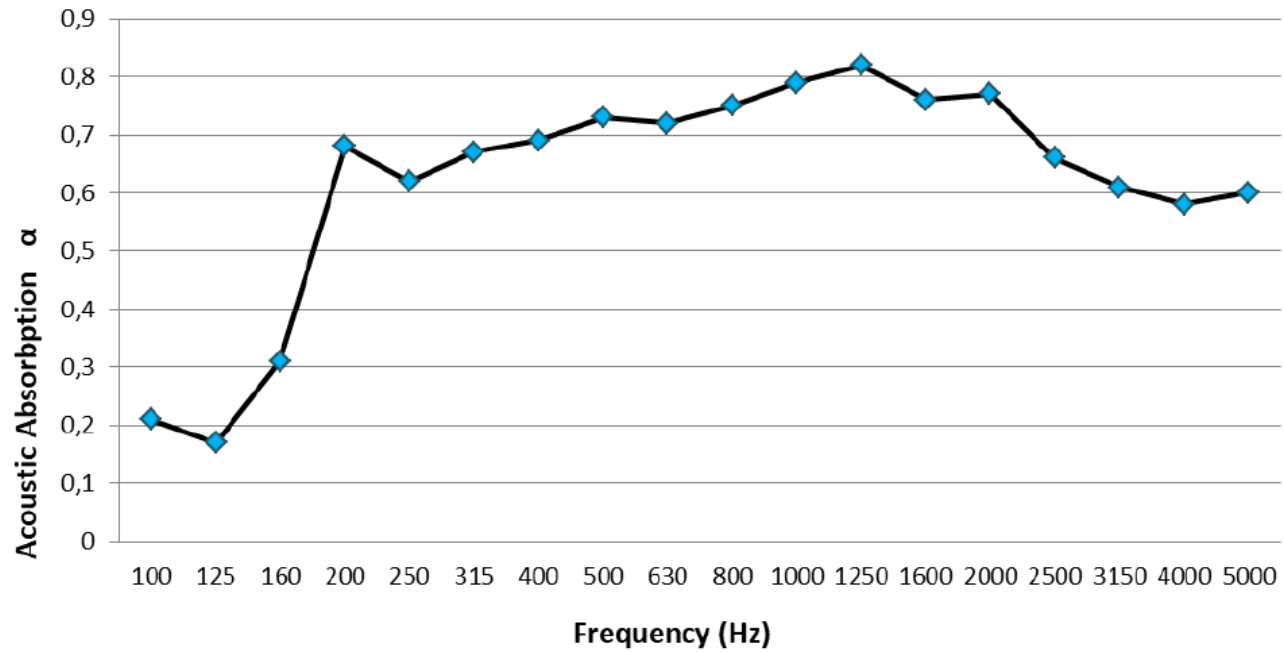
# ACOURETE DIATHONITE ACOUSTIX+



Description	Value
<b>NRC</b>	15mm : 0.47
	20mm : 0.54
	30mm : 0.58
	40mm : 0.66
<b>Density</b>	470 kg/m <sup>3</sup>
<b>Water Absorption</b>	0.35 kg/m <sup>2</sup> h <sup>0.5</sup> (category W2)
<b>Adhesion</b>	0.258 N/mm <sup>2</sup> - FP:C
<b>Fire resistance</b>	Class A1
<b>Thermal Conductivity</b>	0,083 W/mK
<b>Breathability (μ)</b>	4
<b>Mechanical Resistance</b>	3 N/mm <sup>2</sup>
<b>Country of Origin</b>	Italy

*Hall, Home theater, Karaoke room, Music lounge, Auditorium, Worship house*

# ACOURETE DIATHONITE ACOUSTIX+





*Credit: Diasen Diathonite*

**ACOURETE DIATHONITE ACOUSTIX  
at Mahabodhi School**



# Diffuser and other architectural acoustic materials.



**Diffuser QRD 1D**



**Diffuser QRD 2D**



**Corner basstrap**

# Ruang AVI Canisius College

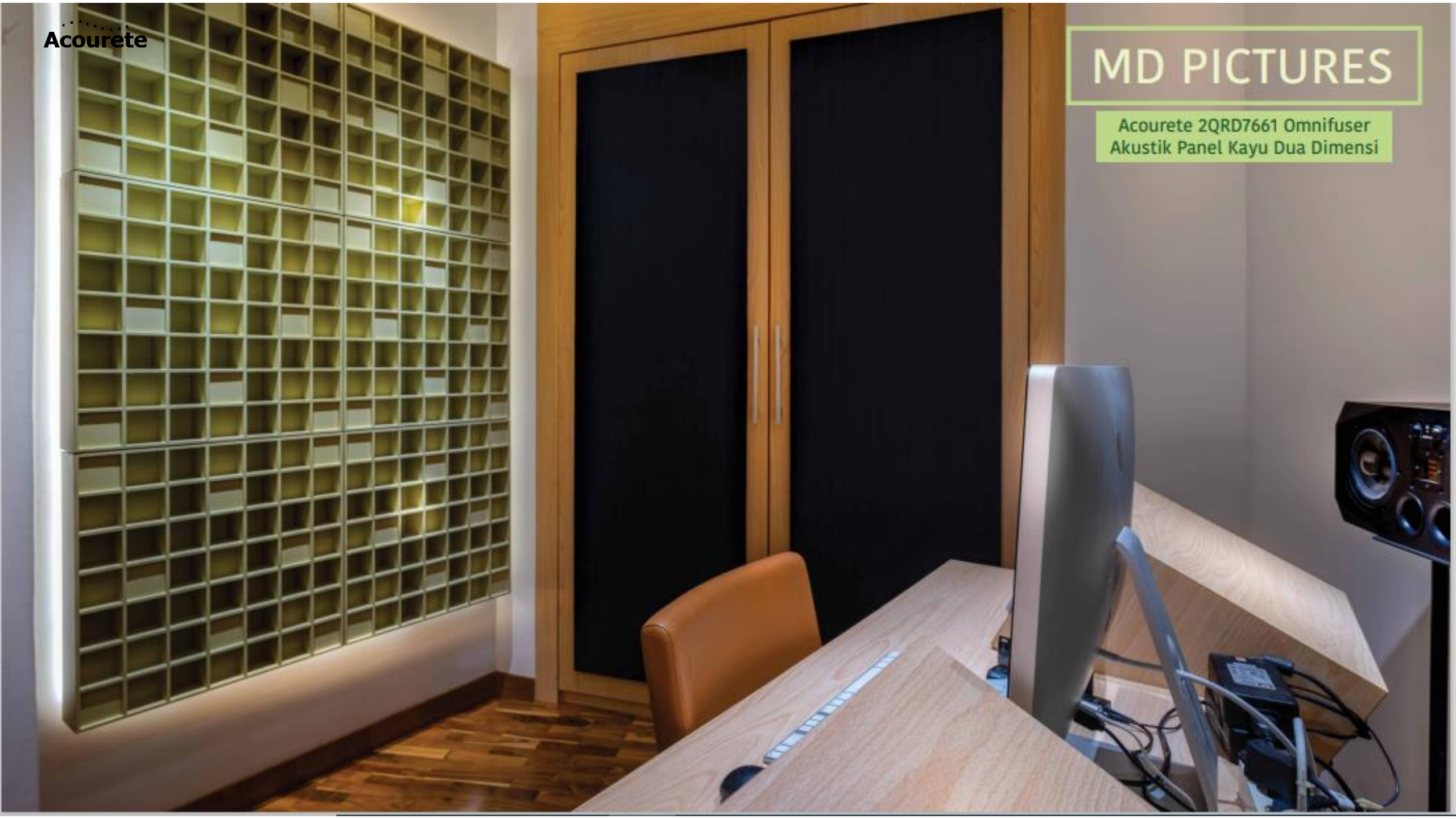
Credit:  
ACOURETE





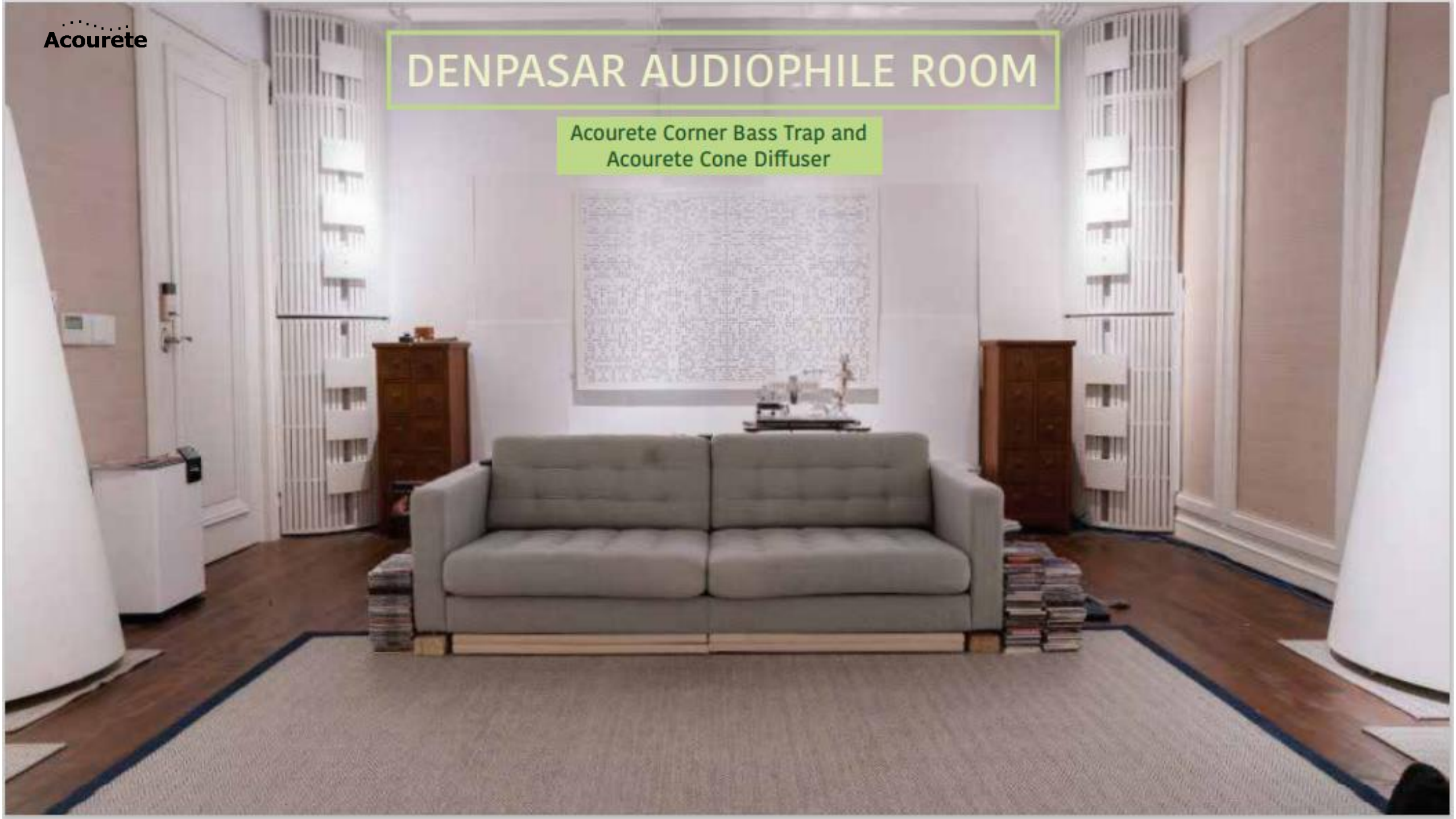
# MD PICTURES

Acourete 2QRD7661 Omnifuser  
Akustik Panel Kayu Dua Dimensi



# DENPASAR AUDIOPHILE ROOM

Acourete Corner Bass Trap and  
Acourete Cone Diffuser



**ACOURETE DIFFUSER QRD 1D  
at Family Home Theatre, HALLING**



# Masjid Istiqlal

Credit: Author



# Elbphilharmonie

Credit: Nagata Acoustic



29/04/2024



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