bio sourced materials

υλικά και παράγωγα
φυσικής προέλευσης και μεταποίησης
στην κτιριακή ακουστική

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https://vimeo.com/313137523

Biosourced materials / Bio-based material

derived from renewable resources,
are increasingly being used in various applications,
including acoustics.

Τα βιοβασικά υλικά προέρχονται από ανανεώσιμη οργανική ύλη (βιομάζα) μικροβιακής, φυτικής, μυκητιακής ή ζωικής προέλευσης. Χρησιμοποιούνται κυρίως ως δομικά υλικά και προϊόντα στην οικοδομική βιομηχανία, αλλά μπορούν επίσης να χρησιμοποιηθούν σε ορισμένα διακοσμητικά προϊόντα, είδη ένδυσης, συσκευασίες και σταθερά έπιπλα.
Τα υλικά αυτά έχουν πολλές μορφές: ξύλο, κάνναβη, άχυρο, βαμβάκι από κυτταρίνη, ανακυκλωμένα υφάσματα, φλοιοί δημητριακών, μίσχανθος, φελλός, λινάρι, ψάθα, γρασίδι λιβαδιού, μανιτάρια (μυκοϋλικά) κ.λπ.1 και ορισμένα είναι προϊόντα αποβλήτων.

Here are some examples of biosourced materials commonly used for acoustic purposes:

Cork:

- Cork is a natural and sustainable material harvested from the bark of cork oak trees. It is known for its excellent acoustic properties and is used in wall panels, flooring, and ceiling tiles to absorb sound.

Wool and Sheep's Wool:

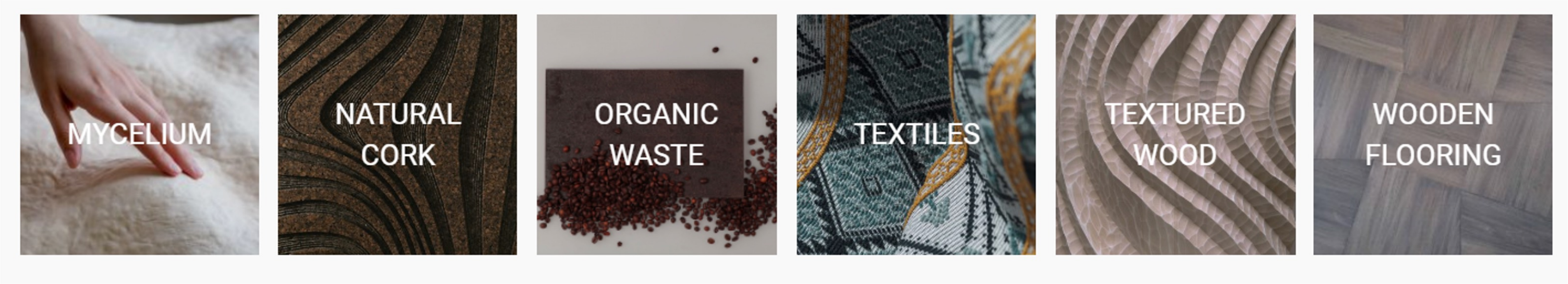
- Wool and sheep's wool are natural fibers that can be used for acoustic insulation. They are often found in carpets, wall coverings, and acoustic panels.

Hemp Fiber:

- Hemp fibers, derived from the hemp plant, are used to make acoustic panels and boards. Hemp is a fast-growing and renewable resource.

Flax Fiber:

- Flax fibers, obtained from the flax plant, are used in the production of acoustic panels. Flax has good sound-absorbing properties and is a sustainable alternative.



Recycled Cotton:

- Acoustic materials made from recycled cotton, such as denim, are used in the manufacturing of sound-absorbing panels and insulation.

Bioplastics:

- Some bioplastics, derived from renewable sources like cornstarch or sugarcane, are used in the production of acoustic panels. These panels can be employed for sound absorption and diffusion.

Mycelium:

- Mycelium, the root structure of fungi, is being explored as a sustainable material for acoustic products. It can be molded into various shapes to create sound-absorbing panels.

Bamboo:

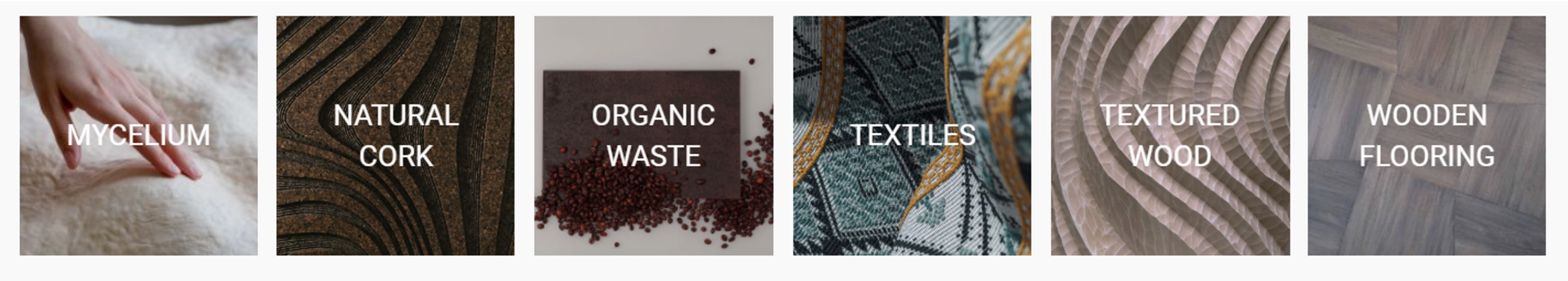
- Bamboo is a rapidly renewable resource that can be used in the production of acoustic panels and flooring. It has good strength and can contribute to sound absorption.

Coconut Coir:

- Coconut coir, derived from the husk of coconuts, is used in the manufacturing of acoustic panels and soundproofing materials.

Sisal:

- Sisal fibers, obtained from the leaves of the agave plant, are used in the production of acoustic panels and wall coverings.



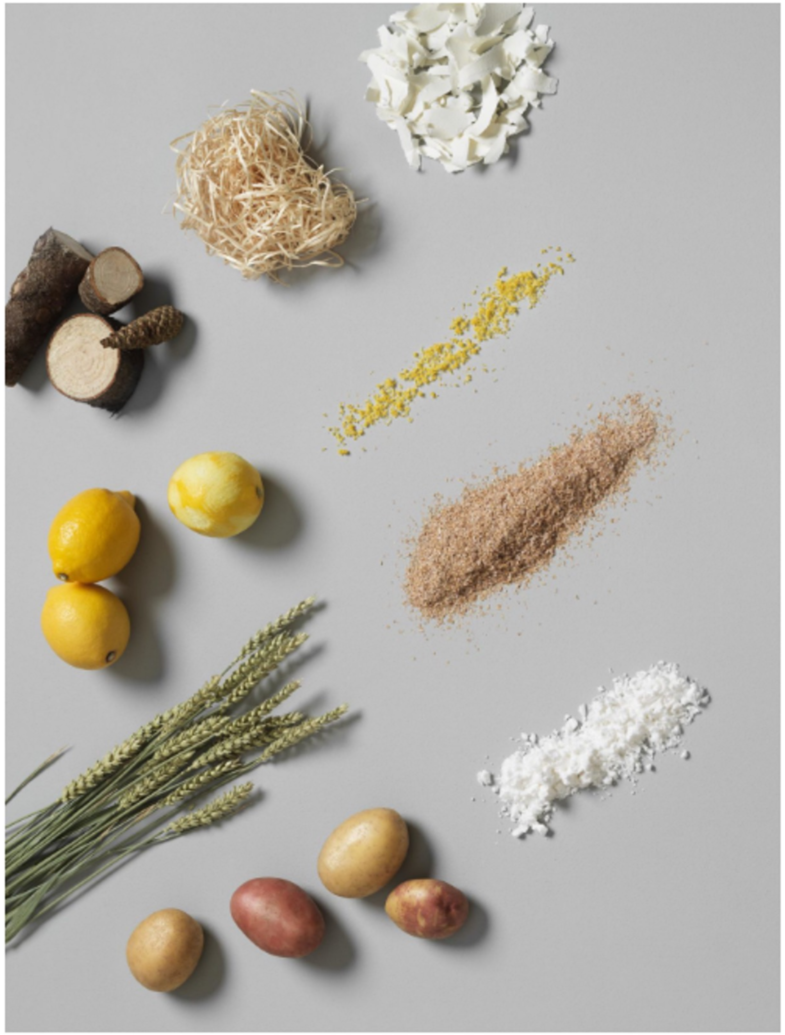
Ετυμολογία και σημασιολογία

- **Ο όρος « βιοβασικά υλικά » [bio-based material] σημαίνει ότι προέρχεται από ζωντανή ύλη, με άλλα λόγια από φυτική ή ζωική βιομάζα**.

- Ορισμένοι χρησιμοποιούν επίσης τον όρο "αγρο-ϋλικά" (και, συναφώς, "αγρο-σύνθετα υλικά") για να αναφερθούν σε υλικά βιολογικής προέλευσης που προέρχονται από τη γεωργία.

- Ο όρος bio-based υλικά δεν θα πρέπει να συγχέεται με τον όρο *οικολογικά υλικά*, ο οποίος περιλαμβάνει επίσης τα γεωλογικά υλικά, καθώς και τα επαναχρησιμοποιημένα και ανακυκλωμένα υλικά.

- Ο όρος « γεωλογικά υλικά » [geo-sourced] αναφέρεται σε υλικά ορυκτής προέλευσης, γνωστά ως πρωτογενή υλικά, τα οποία μπορούν να χρησιμοποιηθούν με μικρή επεξεργασία: ακατέργαστη γη, πέτρα.



Pioneering sustainable materials in acoustics.

Whenever we're looking for new designs, products or materials, nature is always our first source of inspiration.

We strive to create acoustical solutions that not only check the boxes of functionality and design, but that also contribute to creating a better tomorrow for our planet. Nature provides a wellspring of ideas for colours, patterns and shapes. And, when you explore beneath the surface, it holds the key to removing unsustainable ingredients from the equation entirely.

Our criteria for materials:

- It should be possible to trace the material back to it's source of origin
- There should be zero risk of recycled materials containing dangerous content
- Materials should have a low amount of volatile organic compounds (VOC)
- It should be possible to recycle and/or reuse the material

Acoustic insulation solutions
are often implemented in existing buildings to reduce
noise transmission and acoustic phenomena
and improve overall comfort.

Here are some examples of acoustic insulation solutions commonly applied to existing buildings:

Adding Insulation Materials:

- Walls: Installing additional layers of insulation material, such as acoustic panels, mineral wool, or fiberglass, on existing walls can significantly reduce sound transmission.
- Ceilings: Applying acoustic ceiling tiles or adding insulation above the ceiling can help absorb and block sound.

Sealing Gaps and Cracks:

- Identifying and sealing gaps or cracks in walls, windows, doors, and other openings can prevent sound from entering or leaving a space.

Double Glazing or Window Inserts:

- Installing double-glazed windows or adding window inserts with acoustic properties helps reduce noise penetration through windows.

Weather Stripping:

- Applying weather stripping around doors and windows enhances their soundproofing capabilities by creating a tighter seal.

Acoustic Curtains or Drapes:

- Hanging heavy curtains or drapes with acoustic properties can absorb sound and reduce its reflection within a room.

Floor Coverings:

- Using thick rugs or carpets can help dampen sound transmission through floors. Additionally, underlayment materials with acoustic properties can be added beneath flooring.

Wall Coverings:

- Applying acoustic wall coverings or fabric wall panels can absorb sound and improve the overall acoustics of a room.

Bass Traps:

- Installing bass traps in corners of rooms can help control low-frequency sound waves, particularly in spaces where music or home theaters are present.

Resonators and Diffusers:

- Introducing resonators and diffusers strategically within a room can help manage sound reflections and create a more balanced acoustic environment.

Spray Foam Insulation:

- Applying spray foam insulation in wall cavities can reduce both airborne and impact noise.

Mass-Loaded Vinyl (MLV):

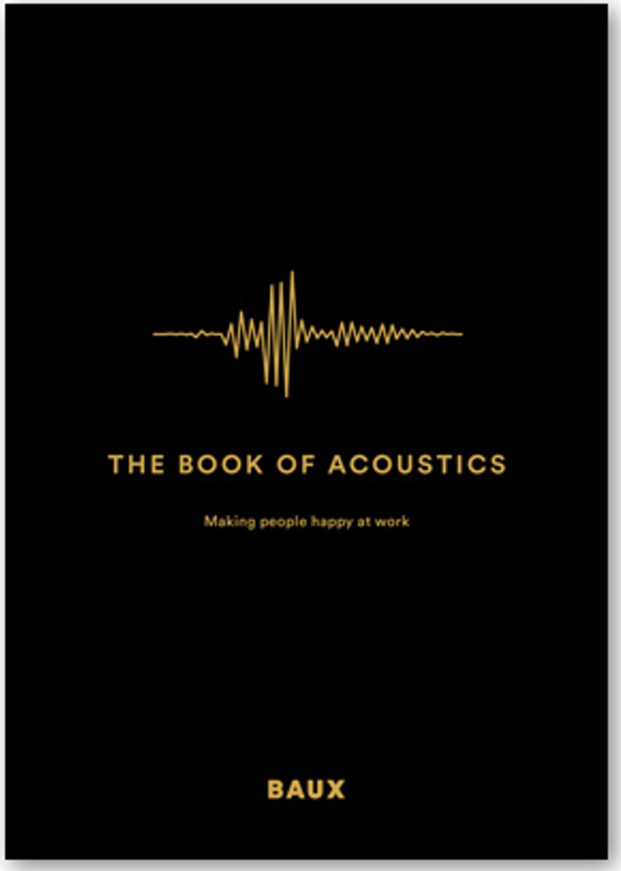
- Adding MLV barriers to walls, ceilings, or floors can effectively block sound transmission.

Acoustic Doors:

- Upgrading doors to those with acoustic seals and heavier mass can significantly improve sound insulation.

Before implementing any acoustic insulation solution, it's crucial to conduct a thorough assessment of the existing building's structure and identify specific areas of concern.

Biosourced materials for Acoustic solutions



THE BOOK OF ACOUSTICS

THIS IS A HANDBOOK FOR ARCHITECTS AND INTERIOR DESIGNERS WHO WANT TO CREATE ACOUSTICALLY BEAUTIFUL SPACES THAT MAKE PEOPLE FEEL HAPPIER, HEALTHIER AND MORE PRODUCTIVE.

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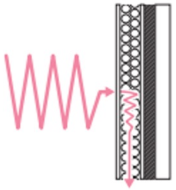

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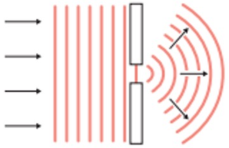
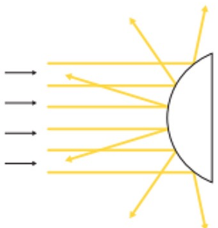
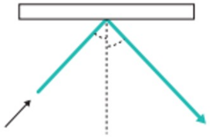


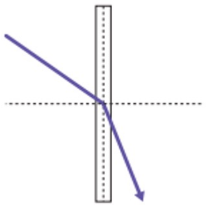
Diffraction



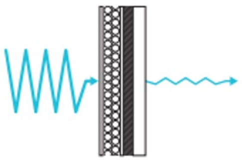
Diffusion



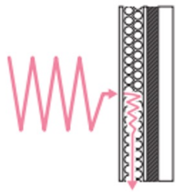
Reflection



Refraction



Transmission



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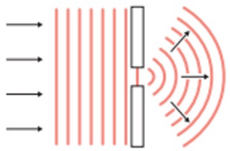

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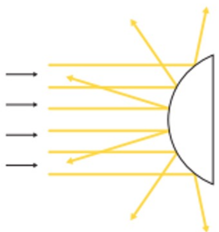

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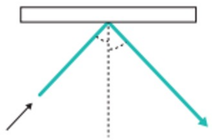

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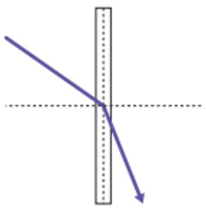

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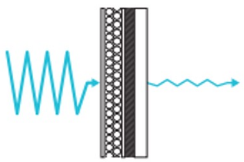
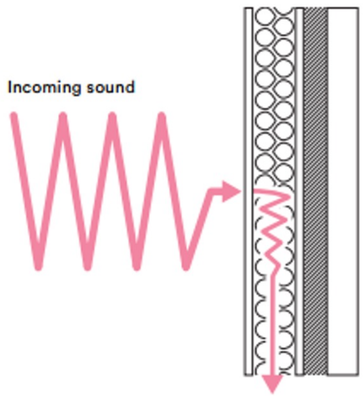


Transmission

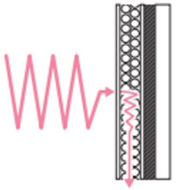
ABSORPTION

Absorption occurs when a sound wave is absorbed by the object or material it encounters. A sound wave that is absorbed transforms into heat energy inside the object or material absorbing it.

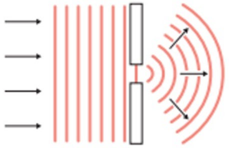
How much energy gets absorbed or continues to travel onward depends on the thickness and nature of the material. Too little absorption causes sound to reflect.



Absorption



Absorption



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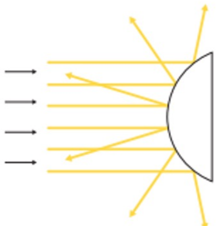

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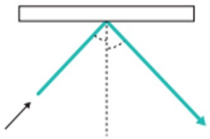

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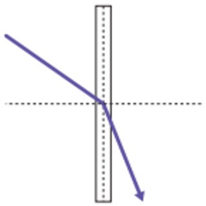

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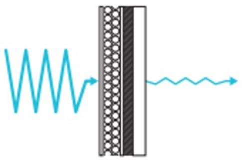
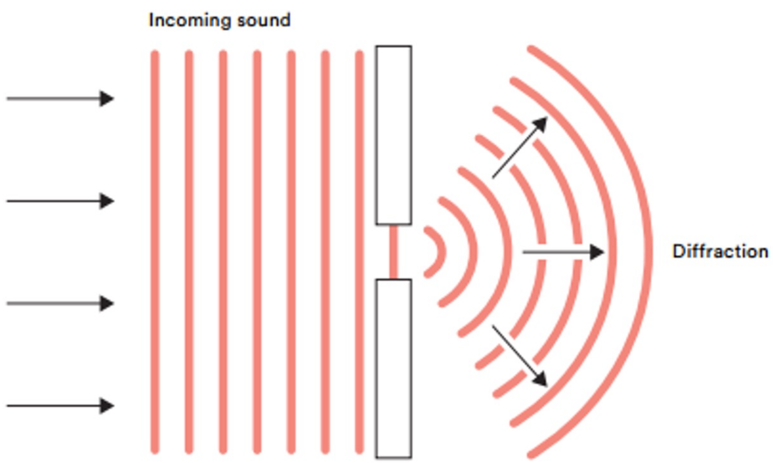
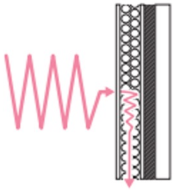


Transmission

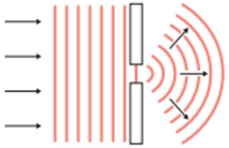
DIFFRACTION

Diffraction is when a sound wave either bends around the edge of the object it encounters, or passes through a narrow opening, such as a doorway, and then spreads out. Diffraction can lead to privacy issues and disruptions, especially in shared, mixed use spaces. It's the reason why someone speaking in a room with an open door can be heard by the people sitting outside.

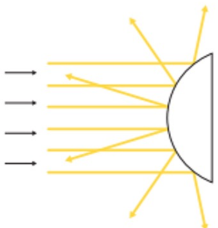




Absorption



Diffraction



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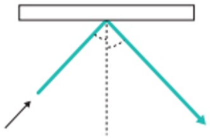

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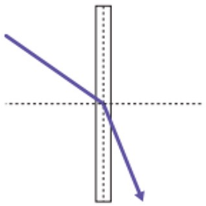

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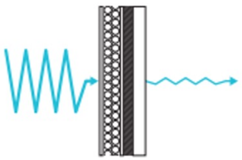
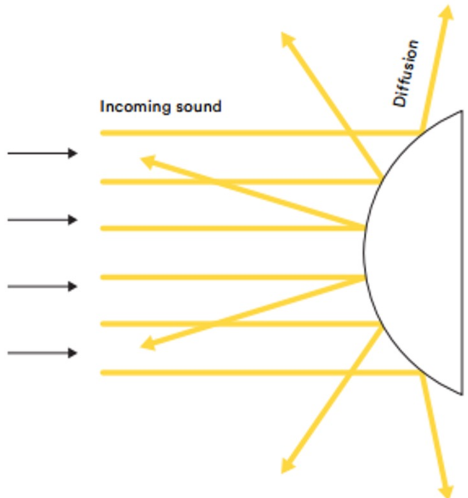
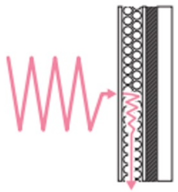


Transmission

DIFFUSION

Diffusion typically occurs when the texture and hardness of the object or material is similar to the sound's wavelength. Exactly how the sound diffuses depends on the nature of the surface texture. Too much diffusion can make it difficult to localise where a sound is coming from. Diffusion occurs when a sound wave diffuses or scatters in different directions upon encountering an object or material.





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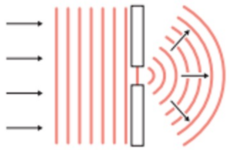

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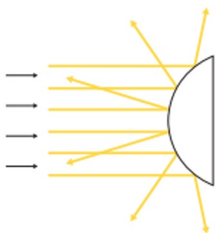

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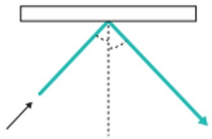

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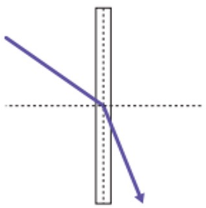

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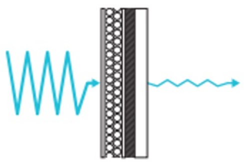
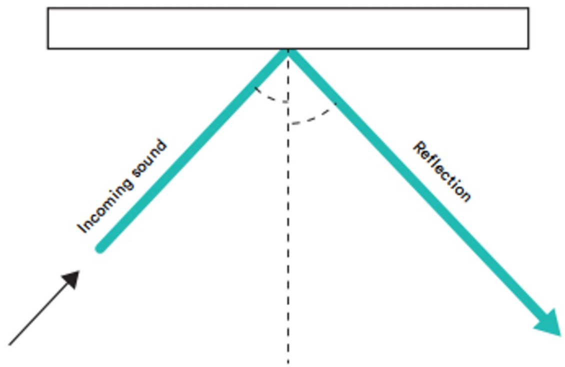
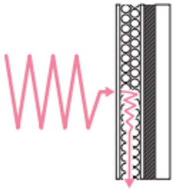


Transmission

REFLECTION

Reflection happens when a sound wave hits an object or surface, such as a wall, and reflects or bounces back. Reflection is most pronounced in rooms with smooth and hard materials like marble or glass. Reflection can result in sound amplification, echos or reverberation. Too much reflection can make a room feel loud and irritating.





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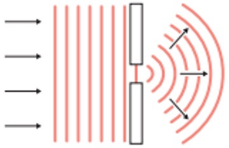

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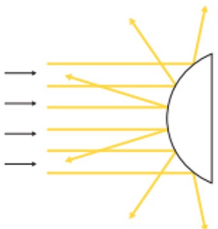

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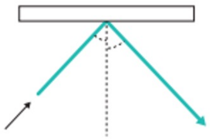

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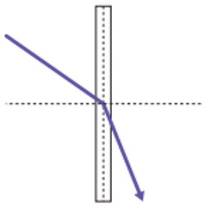

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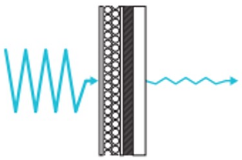
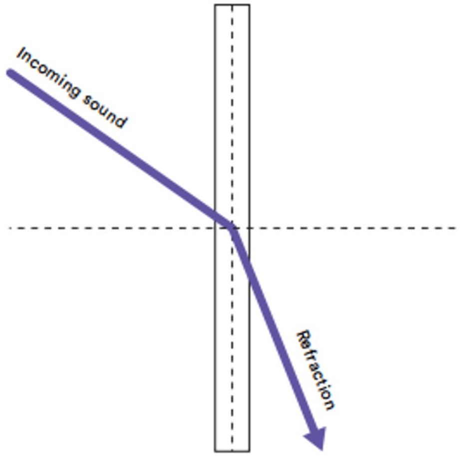
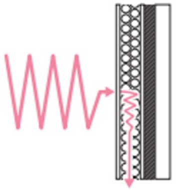


Transmission

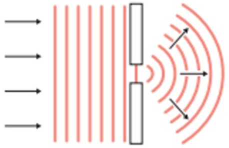
REFRACTION

Refraction occurs when a sound wave bends as it travels from one object or material to another. Both the direction of the sound wave and the speed at which it travels changes depending on the properties of the object or material as well as temperature. Refraction can result in so-called 'shadow zones,' where sound cannot be heard even when the source is within the listener's view.





Absorption



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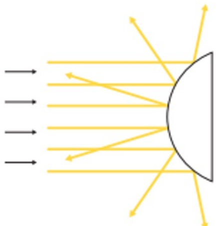

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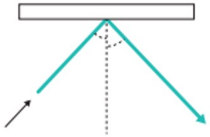

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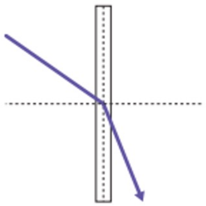
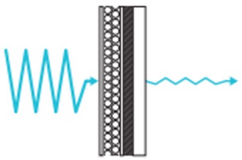


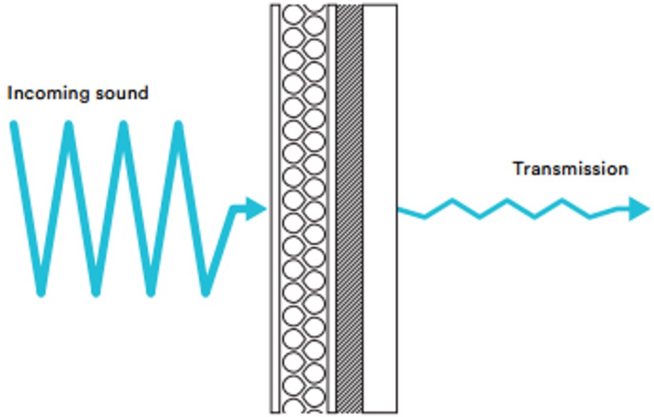
Refraction



Transmission

TRANSMISSION

Transmission takes place when a sound wave transfers from one material or medium to another, and then continues to travel out through the other side. How much transmission occurs depends on how well the acoustical impedances of the two materials match. Transmission becomes problematic when a sound originating from one room travels through the wall to be heard by the people next door.



THE
ABCDs OF
SOUND CONTROL

When setting out to manage sound behaviour and acoustical issues in an indoor space, there are four basic approaches you can take: Absorb, Block, Cover or Diffuse.

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Absorb

Sound can be absorbed or captured by porous treatment materials to diminish the amount of reflection in a space. These materials can be installed on ceilings, floors, walls or be integrated in furnishings and other objects in a space. The goal is not always to add as many absorbers as possible. Rather, the optimal amount of absorbent materials used should be determined by calculating the optimal reverberation time of the specific type of space.

Block

Sound can be blocked, or stopped from traveling, through the introduction of barriers between the sound source and the listeners in a space. A blocker can take the form of a wall, partition, a tall piece of furniture or extra layers of drywall. Blocking can involve sealing off or isolating a sound source, such as a machine, by building a separate room or isolation chamber. Appropriate ceiling material may also be necessary to block unwanted sound transmission.

Cover

Sound can be covered or masked by introducing additional sounds to a space. The aim is to make it more difficult for the brain to detect intelligible fragments of sound or conversation so that focus can be maintained on the intended activity like work tasks, for example. These active solutions are either natural or artificial in nature. Natural solutions might be, for example, an indoor water feature. Artificial solutions typically involve the use of randomly generated electrical signals that are introduced to a space via a loudspeaker.

Diffuse

Sound can be diffused, or scattered in different directions through the introduction of objects or materials with textured or uneven surfaces. Rather than diminish the sound, the idea is to improve its quality by reflecting and spreading it out more evenly. For example, diffusers can be used to address disturbing sound focusing or to make a dull space feel more alive. Diffusers come in different shapes and sizes, from curved panels to quadratic diffusers and custom designs. Different depths of the diffusing surface address specific frequencies.

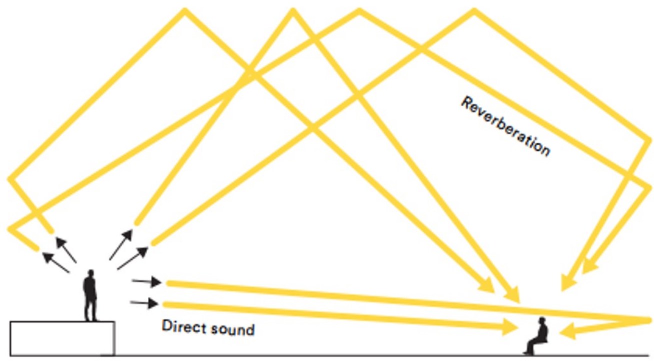
https://www.aalto.fi/en/news/an-unobtrusive-bio-based-acoustic-coating-eliminates-echoes-and-absorbs-carbon


Invisible acoustic coating
A!

REVERBERATION

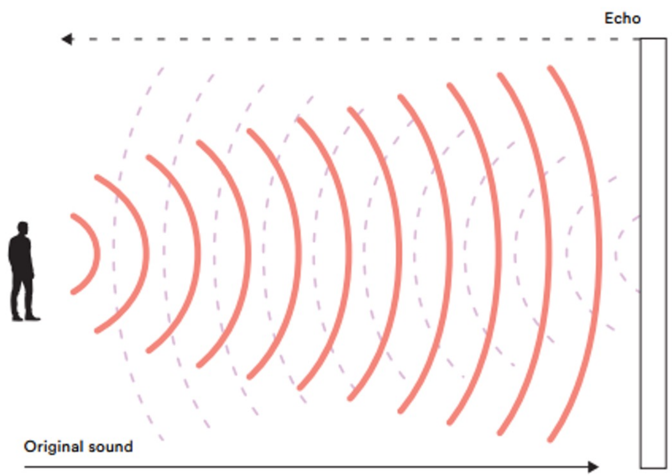
A room with a long reverberation time can be perceived as more spacious and optimise the experience of listening to live music. Reverberation is less optimal for speech, however. When it is too long, it can cause the sounds of individual words spoken consecutively to reverberate simultaneously.

Reverberation is the lifetime or persistence of a sound wave in an enclosed space, measured from the time it first appears to the time it is no longer audible. As a sound wave travels around a space, interacting with different obstacles, it is reflected back and forth between surfaces with some of its energy being absorbed upon each impact until it completely 'dies out'. The more absorbent the room, the more quickly the sound diminishes.



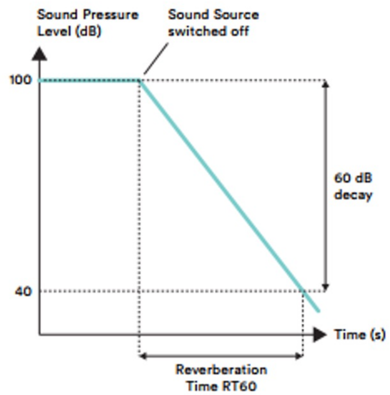
ECHOS

Echoing indoors can make conversation difficult, and amplify distracting sounds. When reverberation time is long enough, an echo can occur. An echo is the distinct repetition of an original sound produced through the reflection of sound waves, which arrives at the listener following a delay. The length of the delay depends on the distances between the reflecting sound surface, the sound source, and the listener. One type of echo that is particularly problematic is a flutter echo. A flutter echo is the phenomenon of sound energy becoming trapped and reflecting repeatedly between two parallel surfaces, such as in a hallway.



REVERBERATION TIME

Reverberation time (RT60) is the lifetime of a sound in a space, or the amount of time it takes for the sound to decrease by 60 decibels (dB) once the source of the emission has stopped. Reverberation time is measured in time (seconds) and sound pressure (dB). Spaces with an RT60 less than 0.3 seconds are considered to be acoustically 'dead', while spaces with an RT60 more than 2 seconds are considered to be 'echoic'.



A long reverberation time may make a room sound echoey, live, and full. A short reverberation time may make a room sound dull or dry. Generally, a large room will have a longer reverberation time than a small room. While a room equipped with many sound-absorbing materials, like carpets and textiles, will have a shorter reverberation time than a room with fewer sound-absorbing materials. Likewise, a room with many reflective materials will have a higher reverberation time than a room that does not. The ideal reverberation time depends on the intended use of the space.

A simplified calculation of reverberation time (T) can be conducted using the volume of the room (V) and absorption surface area (A), according to Sabine's formula: $T = 0.16 \times (V/A)$

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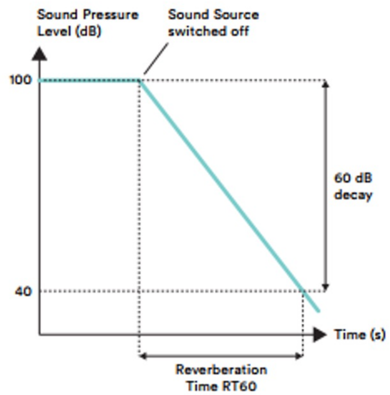

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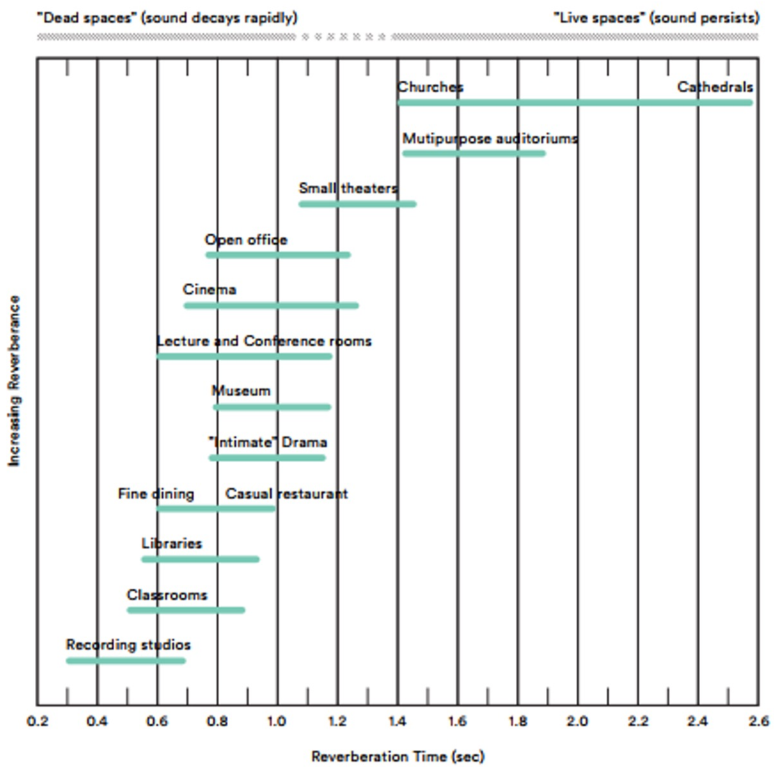
Ideal reverberation times for different kinds of spaces



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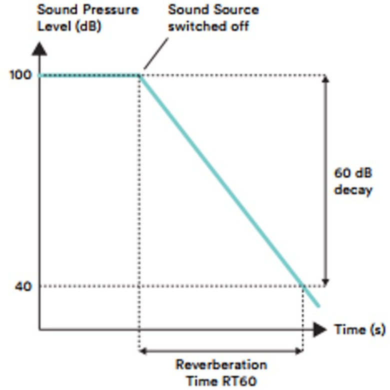


Sound absorption coefficients for common materials

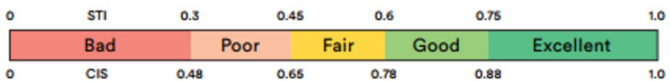
Material	Coefficient (a) 500HZ	1000HZ	2000HZ	Material	Coefficient (a) 500HZ	1000HZ	2000HZ
Walls				**Floor**			
Brick, unglazed	.03	.04	.05	Concrete or Terrazzo	.015	.02	.02
Brick, unglazed, painted	.02	.02	.02	Linoleum, asphalt, rubber, or cork tile on concrete	.03	.03	.03
Plaster, gypsum, or lime, smooth finish on tile or brick	.02	.03	.04	Wood	.10	.07	.06
Plaster, gypsum, or lime, rough or smooth finish on lath	.06	.05	.04	Wood parquet in asphalt on concrete	.07	.06	.06
Concrete block, light, porous	.31	.29	.39	Carpet, heavy, on concrete	.14	.37	.60
Concrete block, dense, painted	.06	.07	.09	Same, on 40 oz hairfelt or foam rubber	.57	.69	.71
Gypsum boards. 1/2-inch nailed to 2×4s, 16 inches o.c.	.05	.04	.07	Same, with impermeable latex backing on 40 oz hairfelt or foam rubber	.39	.34	.48
Plywood paneling, 3/8-inch thick	.17	.09	.10	Marble or glaze tile	.01	.01	.02
Large panes of heavy plate glass	.04	.03	.02	**Fabrics**			
Ordinary window glass	.18	.12	.07	Light velour, 10 oz per sq yd, hung straight, in contact with wall	.11	.17	.24
Misc				Medium velour, 14 oz per sq yd, draped to half area	.49	.75	.70
Chairs, metal or wood seats, each, unoccupied	.22	.39	.38	Heavy velour, 18 oz per sq yd, draped to half area	.55	.72	.70

SPEECH INTELLIGIBILITY

Speech intelligibility is a measure of the quality of the transmission of speech. Speech intelligibility is particularly important in public spaces where occupants need to be able to clearly hear and understand instructions, whether the instructions are coming from a person in the same room or via an electronic public address or voice alarm system. For instance, this could apply to classrooms, auditoriums, churches, conference rooms, concert halls, airports, trains stations and shopping centres.

Speech intelligibility is calculated according to a standard index using acoustical measurements of speech and noise. A number of factors influence speech intelligibility, including ambient noise level, reverberation time, the frequency response of a room, psychoacoustic masking effects, as well as the quality of any sound reproduction equipment being used to transmit sound in the space.

The Speech intelligibility index (SII) is represented on a numeric scale called the Common Intelligibility Scale (CIS). The value ranges from 0 to 1, or bad to excellent, and indicates the degree to which a space, aka transmission channel, degrades speech intelligibility.



The Speech Intelligibility Index (SII)

Category	Nominal STI value	Type of message information	Examples of typical usage	Comment
A+	>0,76		Recording studios	Excellent intelligibility but rarely achievable in most environments
A	0,74	Complex messages, unfamiliar words	Theatres, Speech auditoria, parlaments, courts, Assistive Hearing Systems (AHS)	High speech intelligibility
B	0,7	Complex messages, unfamiliar words		
C	0,66	Complex messages, unfamiliar words	Theatres, Speech auditoria, teleconferencing, parlaments, courts	High speech intelligibility
D	0,62	Complex messages, familiar words	Lecture theatres, classrooms, concert halls	Good speech intelligibility
E	0,58	Complex messages, familiar context	Concert halls, modern churches	High quality PA systems
F	0,54	Complex messages, familiar context	PA systems in shopping malls, public building offices, VA systems, cathedrals	Good quality PA systems
G	0,5	Complex messages, familiar context	Shopping malls, public building offices, VA systems	Target value for VA systems
H	0,46	Simple messages, familiar words	VA and PA systems in difficult acoustic environments	Normal lower limit for VA systems
I	0,42	Simple messages, familiar context	VA and PA systems in very difficult spaces	
J	0,38		Not suitable for PA systems	
U	<0,36		Not suitable for PA systems	

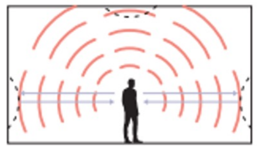
TREATMENT PLACEMENT BY ROOM SHAPE

The geometry of a room shapes the acoustic environment

The shapes created by the location of constructed walls and barriers also form the acoustic character of a space. As these diagrams illustrate, convex and elaborate surfaces cause sound to scatter, flat surfaces cause sound to reflect, and concave surfaces tend to focus sound waves as they reflect away. Collectively, the surfaces of a given space not only influence how sound will behave but also the path that it will take.

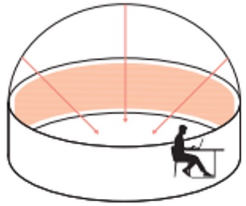
If you are in the position to influence the architectural layout of a space, you can make decisions early on that lead to optimal acoustics instead of having to fix problems later. Generally, domes and round shapes should be avoided when possible as they cause sound focusing issues. Parallel surfaces are also problematic, leading to excessive reflection issues such as flutter echos.

Small spaces

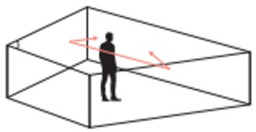


Large spaces

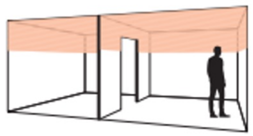
Hallways



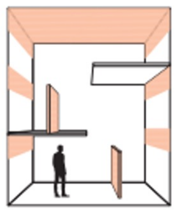
Circular spaces



Slanted surfaces



Connecting rooms



Multi-storey spaces

Fanocel

Bio Based, Organic Waste,
Recycled materials, Recycled Paper

Fields Acoustic Panels

Bio Based, Mycelium

Floor Flex

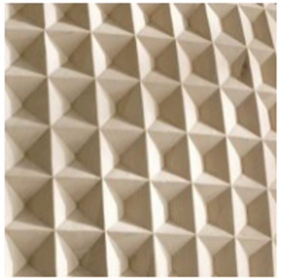
Bio Based, Organic Waste

Foresta Acoustic System

Bio Based, Mycelium

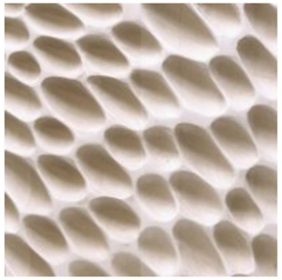
Full Pibiones

Bio Based, Textiles, Woven Textiles



Gouged

Bio Based, Textured Wood



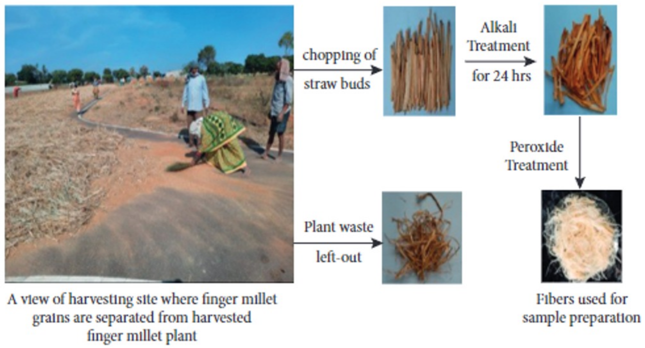


Figure 1: Fiber extraction from finger millet straws at Bandipalya.

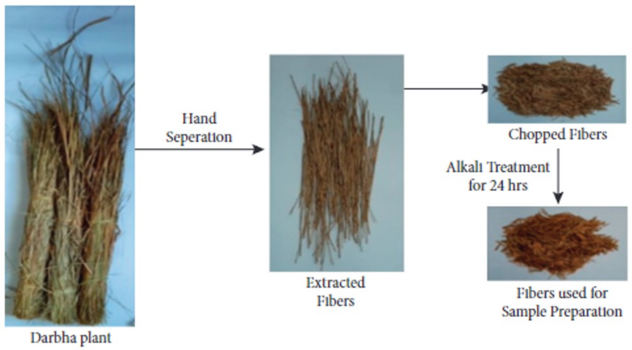


Figure 2: Darbha fiber extraction from darbha plant.

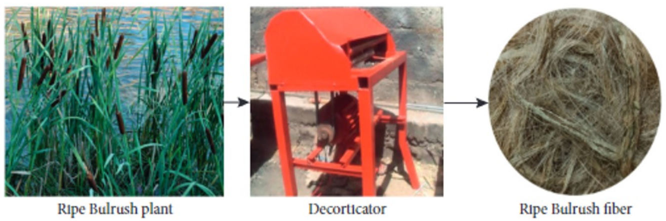
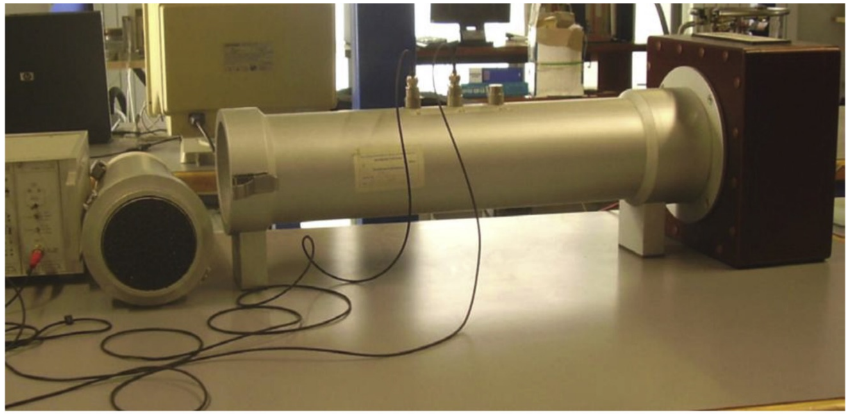


Figure 3: Fiber extraction from ripe bulrush.



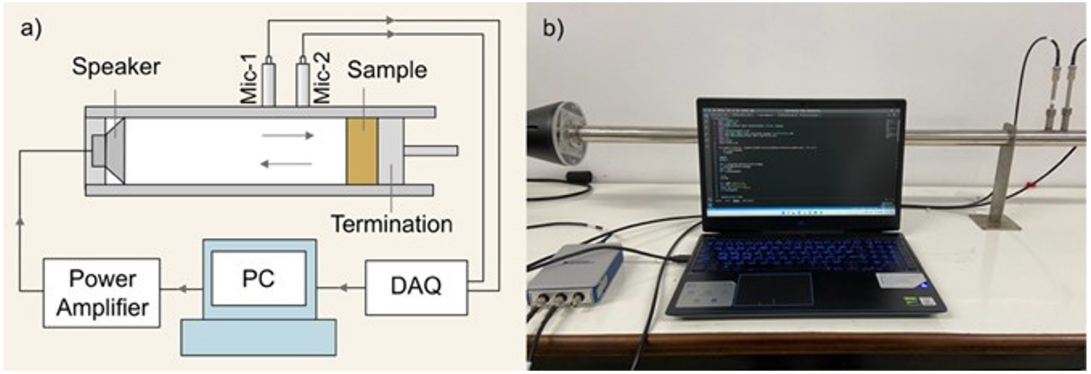
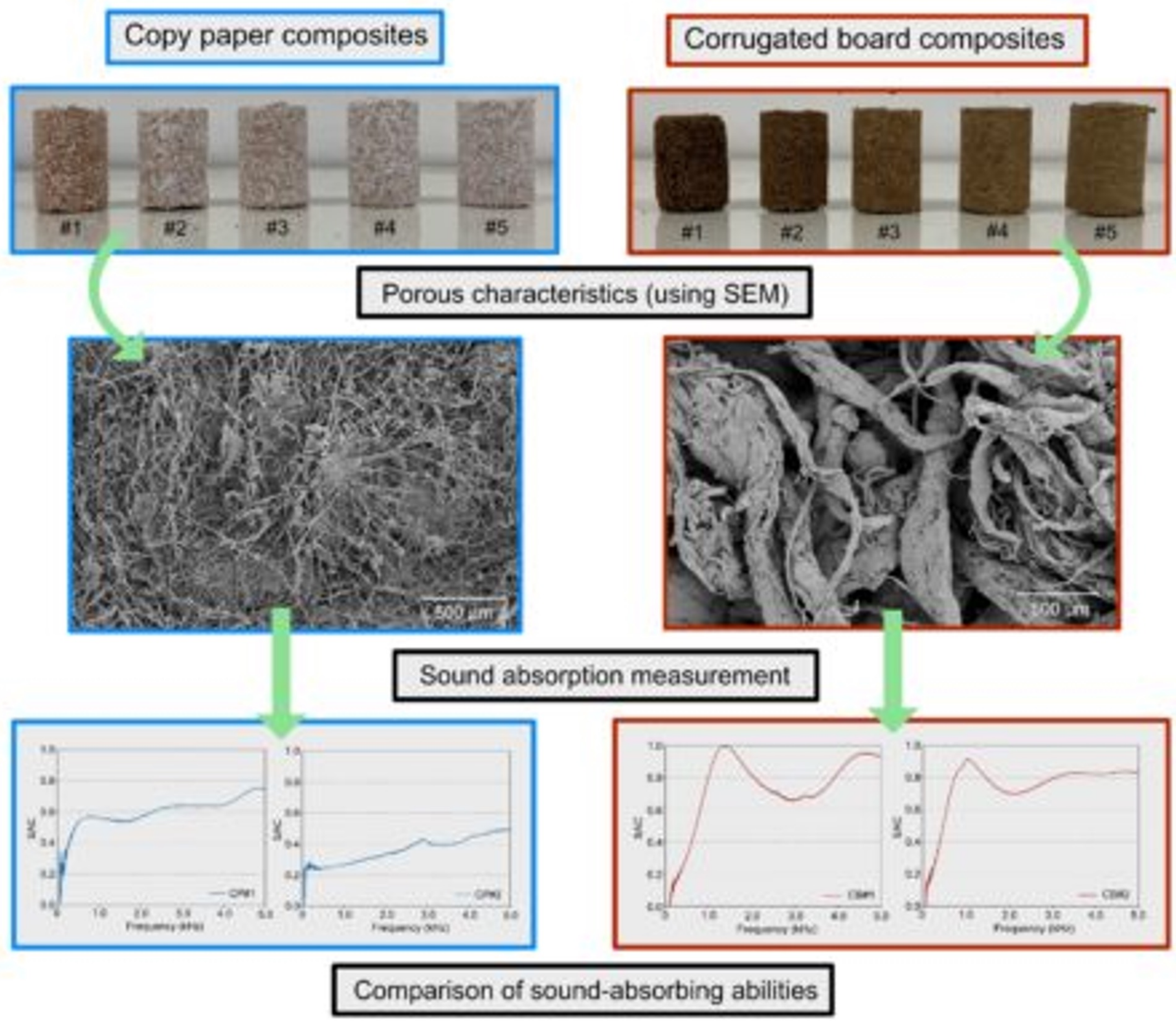


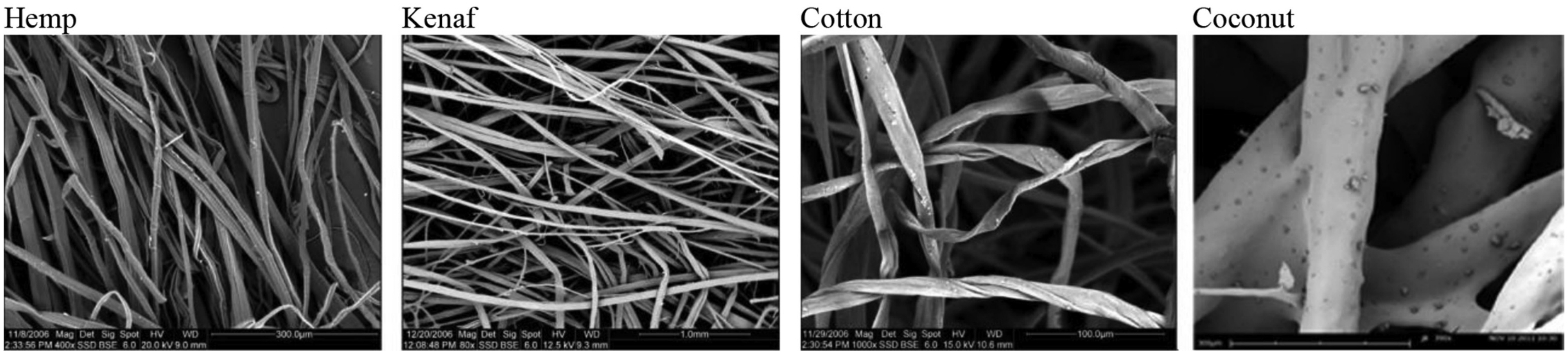
Diagram of the cylindrical two-microphone impedance tube and b) the image of the impedance tube setup used in the measurement

Kundt's tube for the absorption coefficient measure (above) and airflow resistance measurement system at alternate airflow (below

https://doi.org/10.1016/j.buildenv.2015.05.029

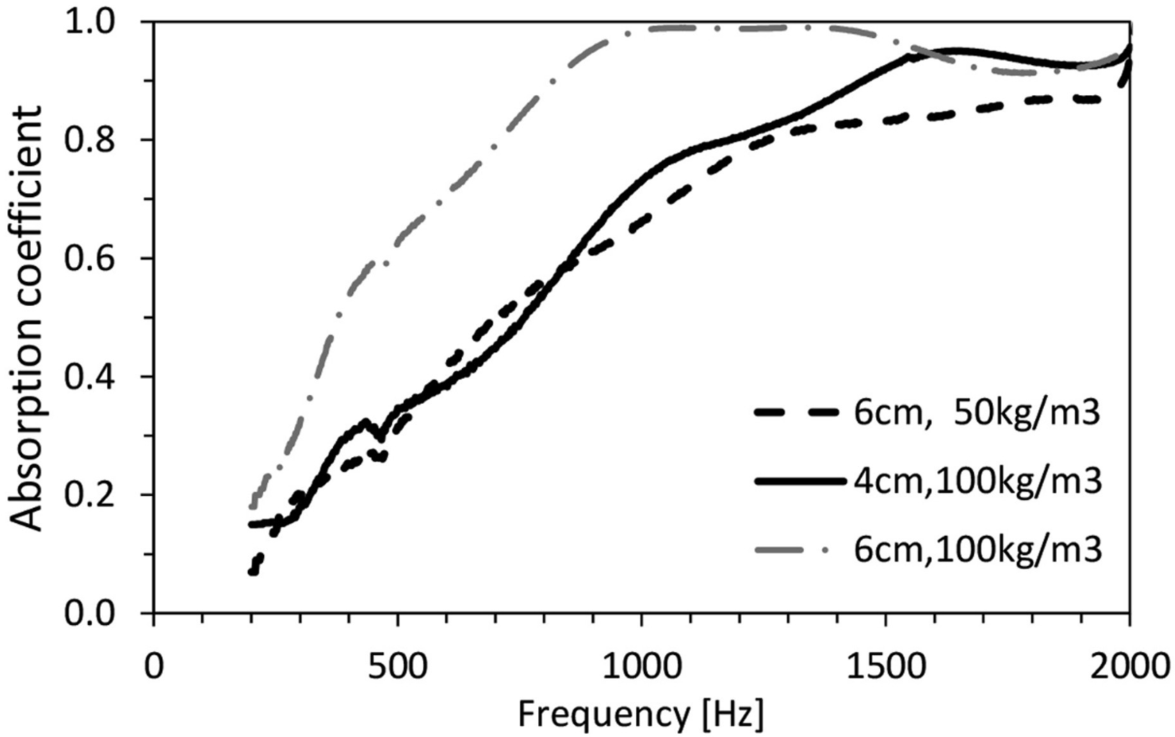
Chanlert, P., Jintara, A., and Manoma, W. (2022). "**Compa absorption properties of acoustic absorbers made fro and corrugated board**," *BioResources* 17(4), 5612-5621.


Copy paper composites
Corrugated board composites
#1
#2
#3
#4
#5
Porous characteristics (using SEM)
Sound absorption measurement
Comparison of sound-absorbing abilities



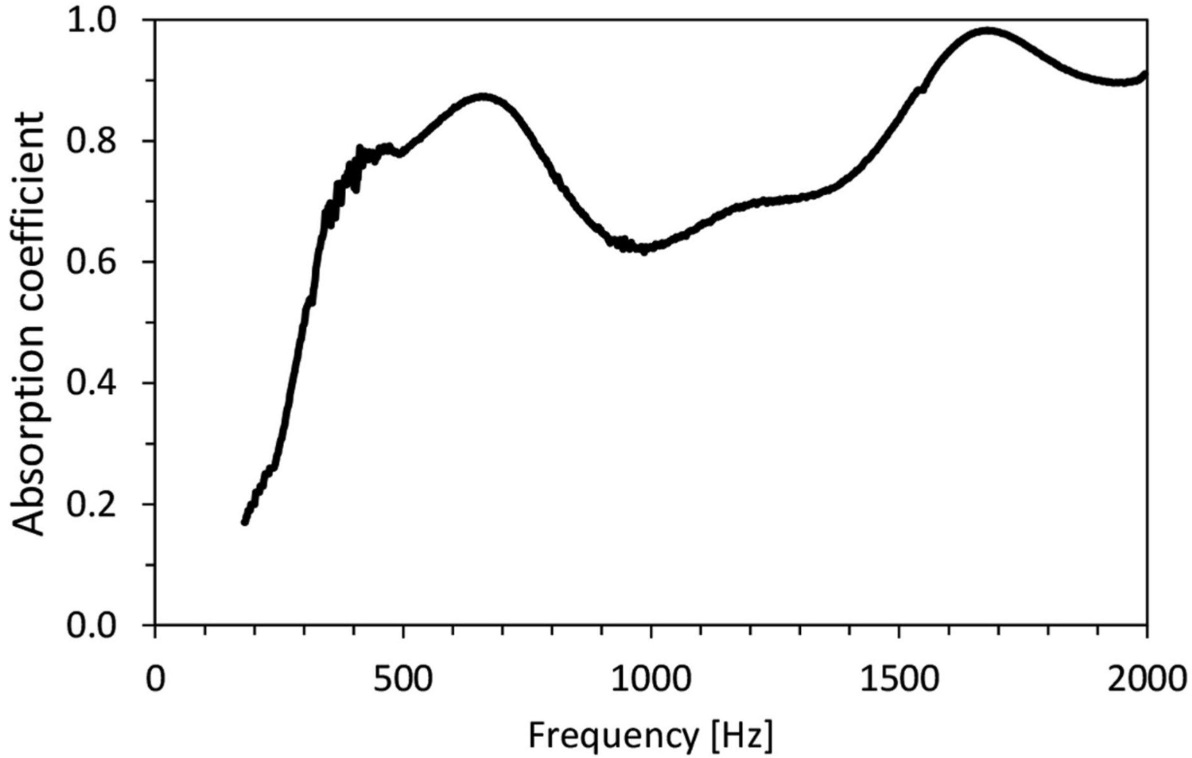
Electronic microscopy images at different scales for some natural fibers. From left to right: hemp, kenaf, cotton, and coconut
(images courtesy of Dr. Jesus Alba – Universitat Politècnica de València, Spain)

https://doi.org/10.1016/j.buildenv.2015.05.029



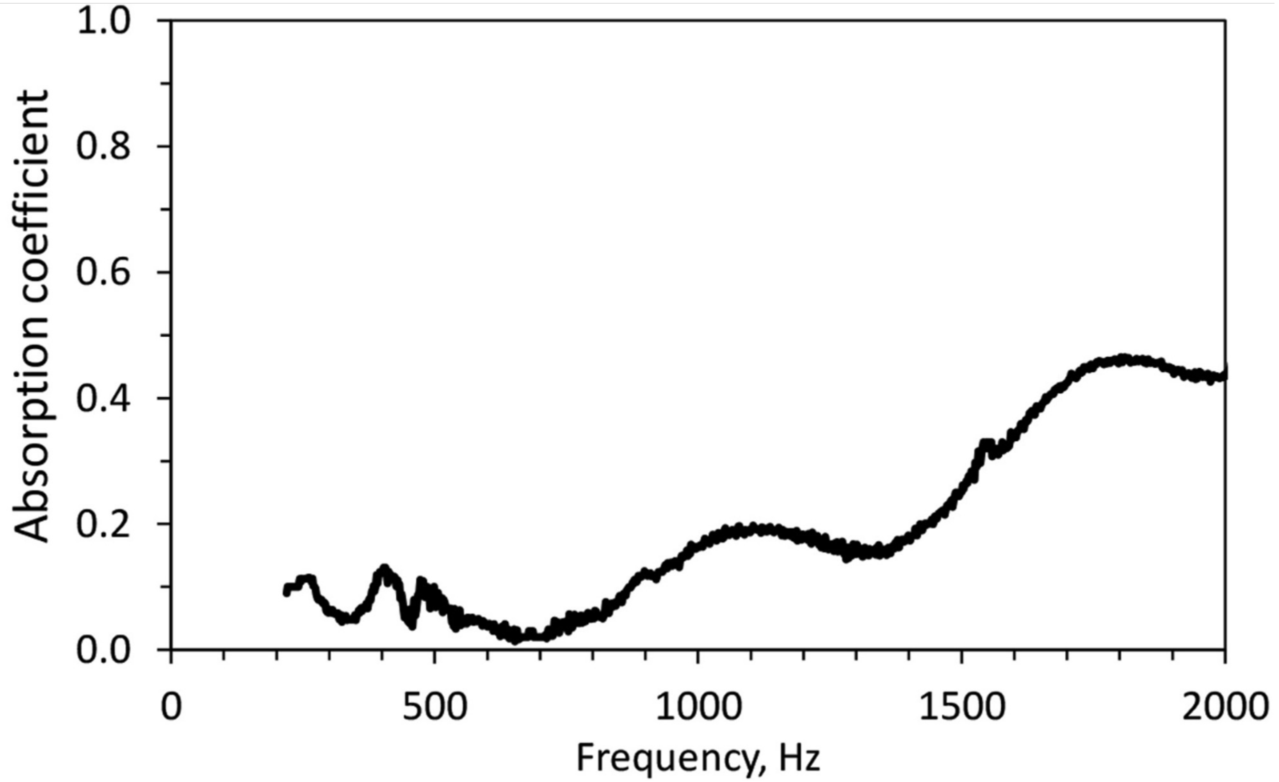
Absorption coefficient of kenaf samples with different density and thickness.

https://doi.org/10.1016/j.buildenv.2015.05.029



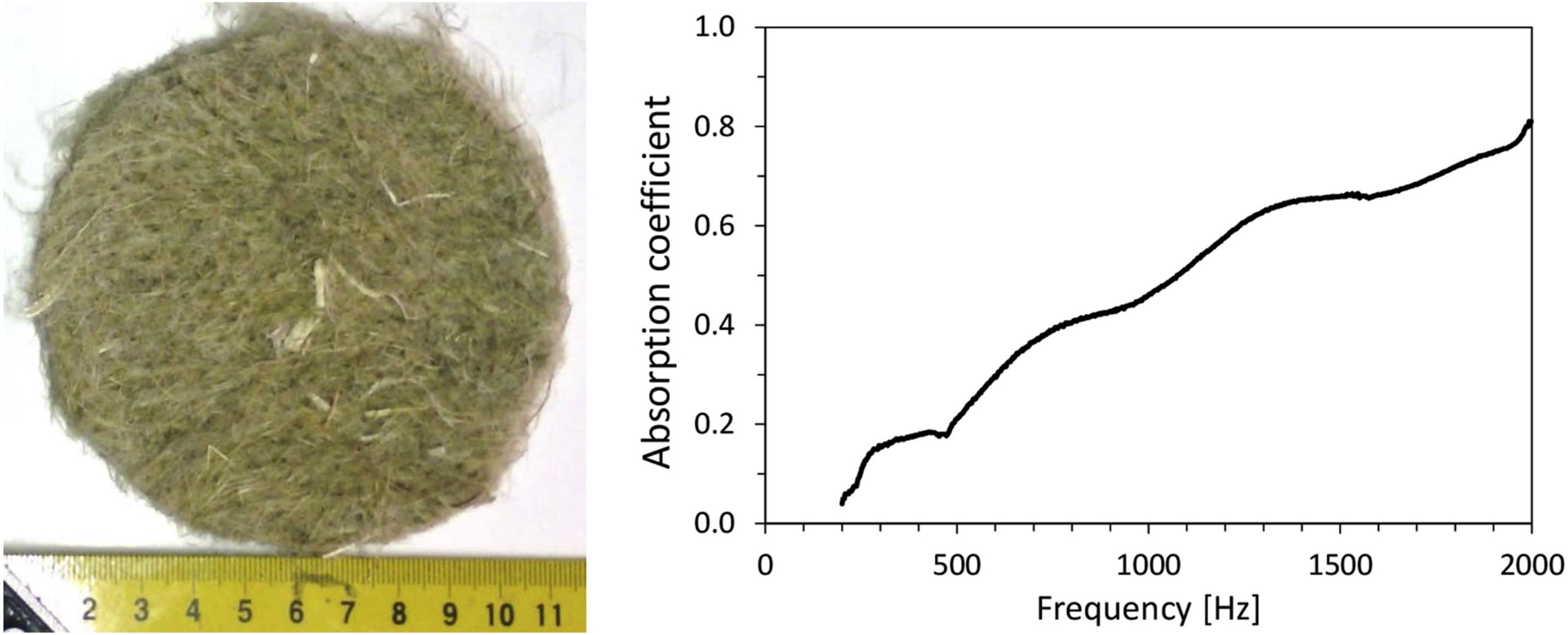
Absorption coefficient of wood fiber 6 cm thick.

https://doi.org/10.1016/j.buildenv.2015.05.029



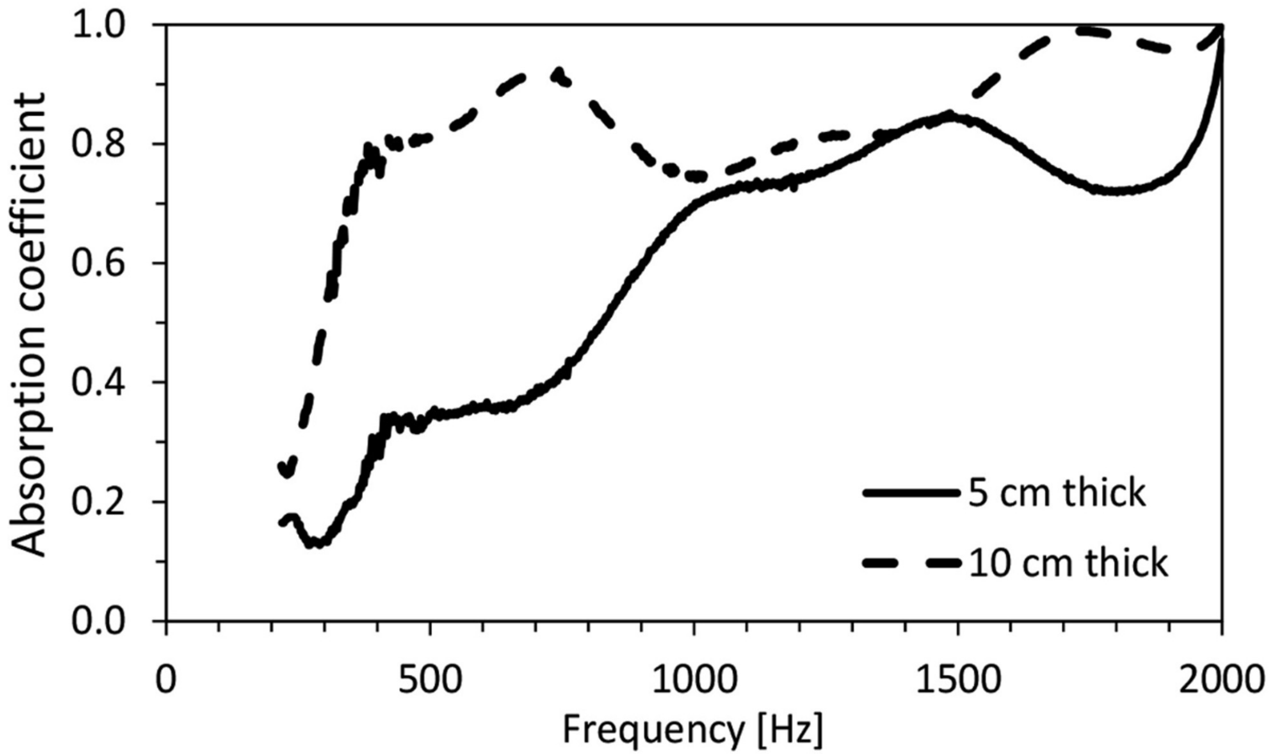
Absorption coefficient of mineralized
wood fiber 3 cm thick.

https://doi.org/10.1016/j.buildenv.2015.05.029



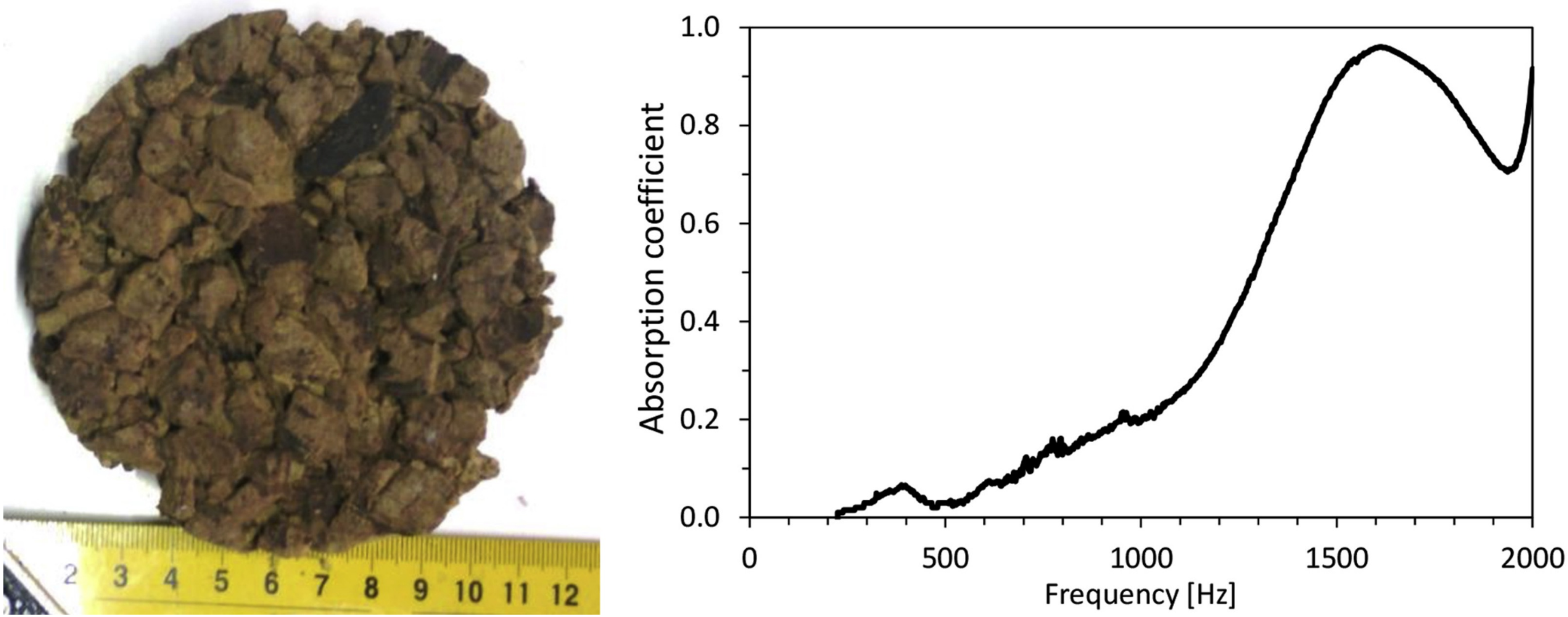
Absorption coefficient of hemp fiber 3 cm thick.

https://doi.org/10.1016/j.buildenv.2015.05.029



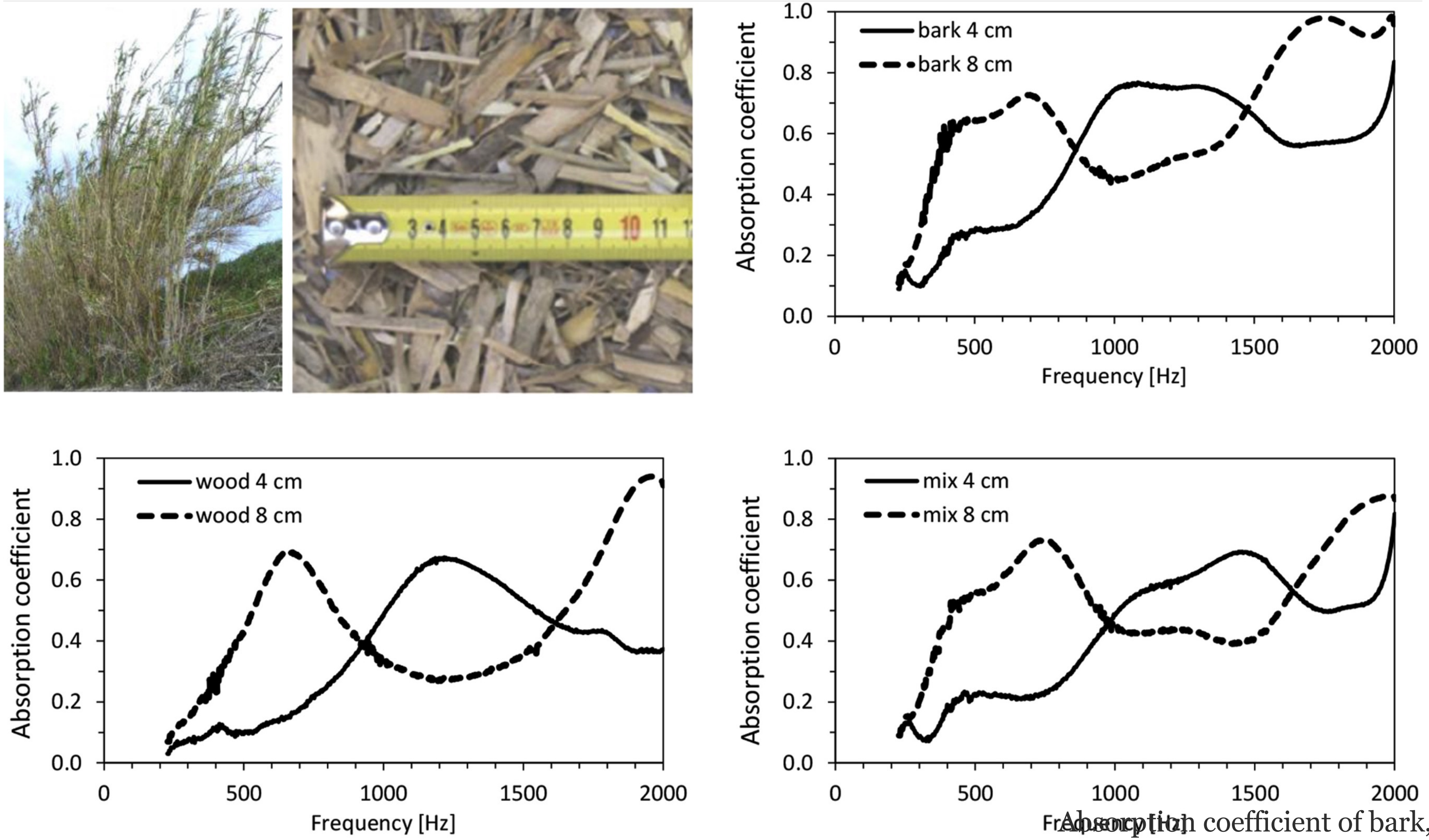
Absorption coefficient of coconut fiber, 5 and 10 cm thick.

https://doi.org/10.1016/j.buildenv.2015.05.029



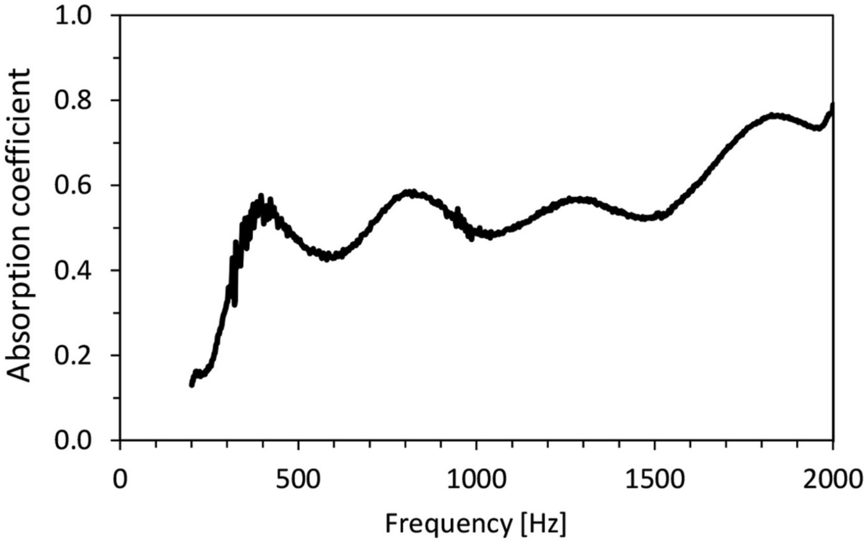
Absorption coefficient of cork 3 cm thick.

https://doi.org/10.1016/j.buildenv.2015.05.029



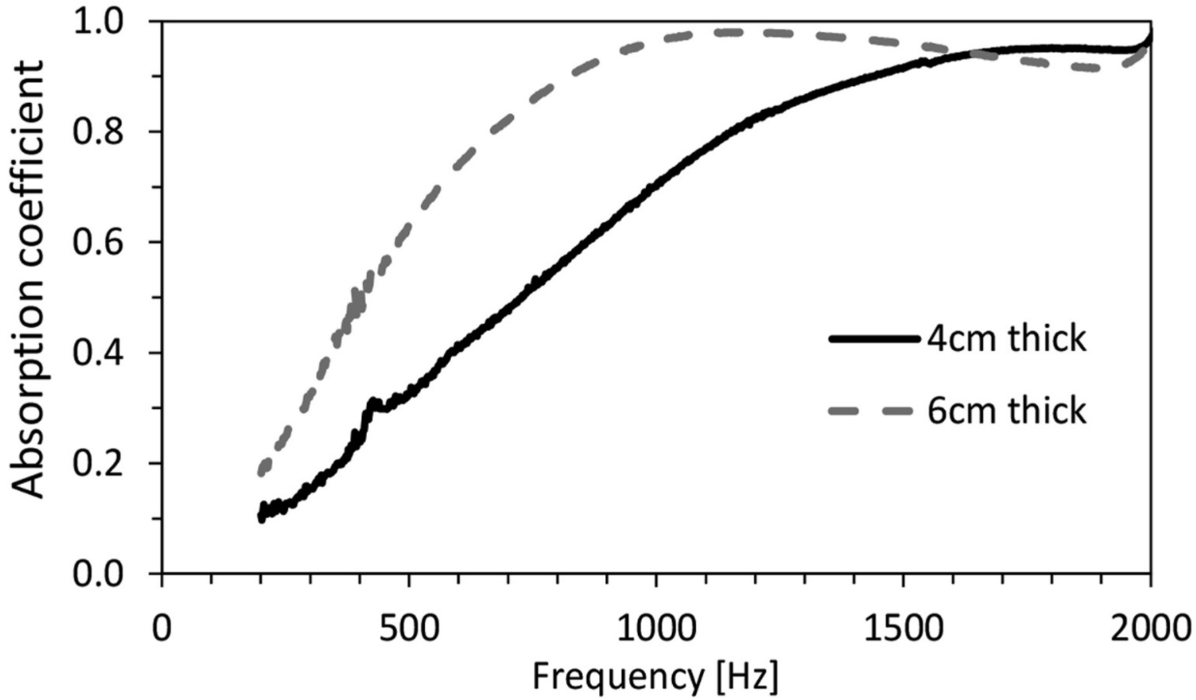
Absorption coefficient of bark, wood and mix of water canes, 4 and 8 cm thick.

https://doi.org/10.1016/j.buildenv.2015.05.029



Absorption coefficient of recycled cardboard 11.5 cm thick.

https://doi.org/10.1016/j.buildenv.2015.05.029



Absorption coefficient of sheep wool 4 and 6 cm thick.

https://doi.org/10.1016/j.buildenv.2015.05.029

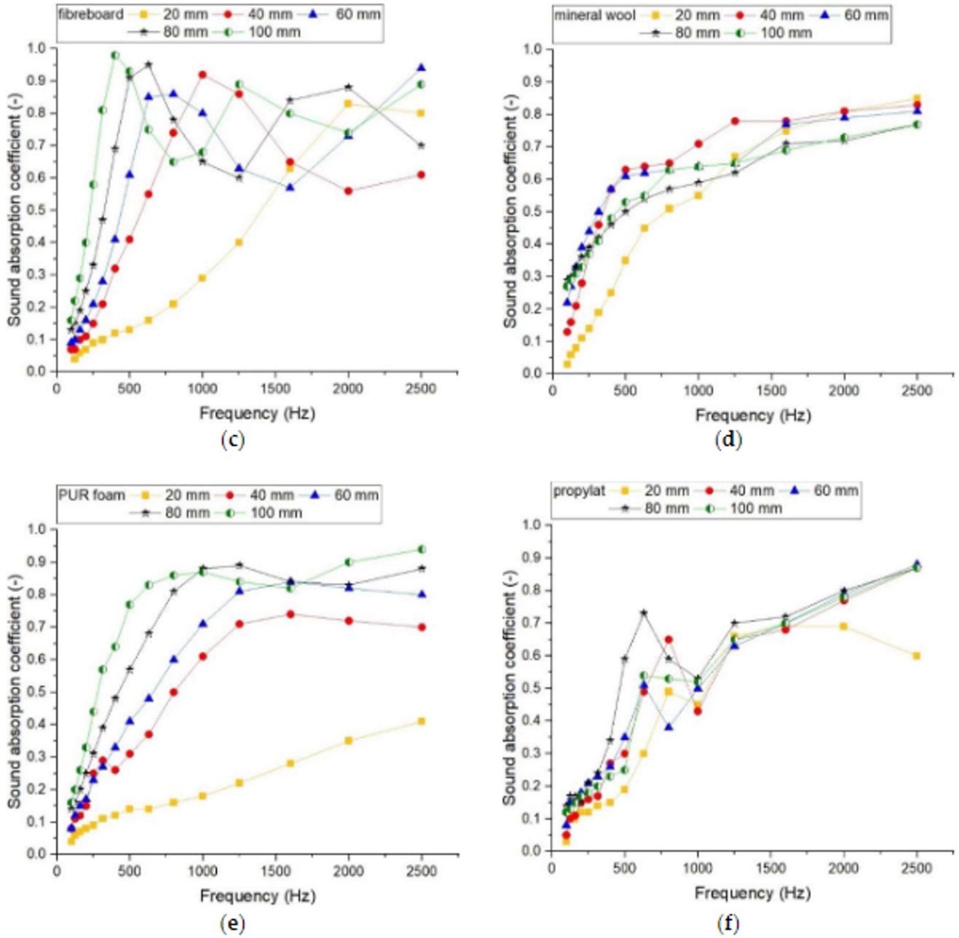


Figure 7. Comparison of sound absorption coefficient of single material with thicknesses of 20 mm, 40 mm, 60 mm, 80 mm and 100 mm for: (**a**) cork, (**b**) hemp, (**c**) fibreboard, (**d**) mineral wool, (**e**) PUR foam, (**f**) propylat.

Fanocel

Discover Fanocel, a sustainable alternative to plastic materials sourced from fossil fuels. This bio-composite material is made from cellulose acetate and by-products of the agri-food sector. Cellulose, extracted from natural resources like cotton plants and wood fibers, along with acetic acid, forms the foundation of Fanocel. This material is water-repellent, elastic, durable, and non-toxic. Responsible dyes, derived from agri-food by-products such as hemp leftovers, charcoal, and tobacco remnants, are used. Fanocel offers a versatile and sustainable solution for various design applications, including flooring, wall panels, tiles, and more.

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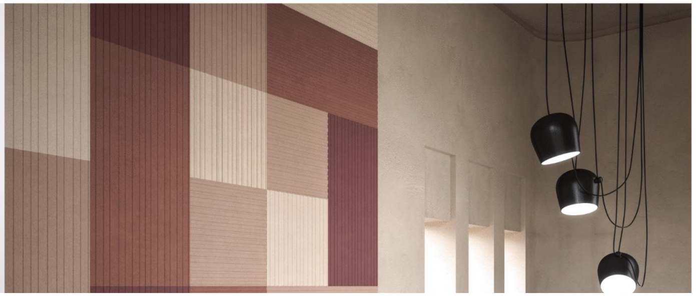
Mycelium (pl.: **mycelia**) is a root-like structure of a fungus consisting of a mass of branching, thread-like hyphae.[1] Fungal colonies composed of mycelium are found in and on soil and many other substrates. A typical single spore germinates into a monokaryotic mycelium,[1] which cannot reproduce sexually; when two compatible monokaryotic mycelia join and form a dikaryotic mycelium, that mycelium may form fruiting bodies such as mushrooms.[2] A mycelium may be minute, forming a colony that is too small to see, or may grow to span thousands of acres as in *Armillaria*.

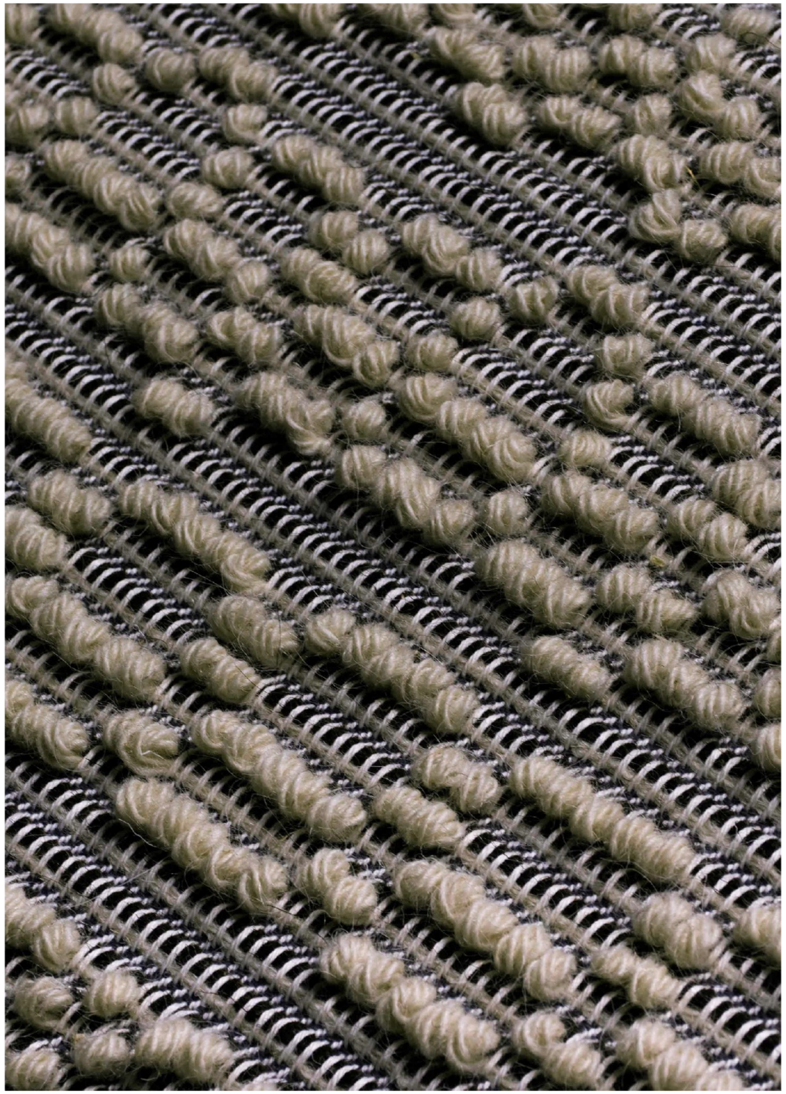


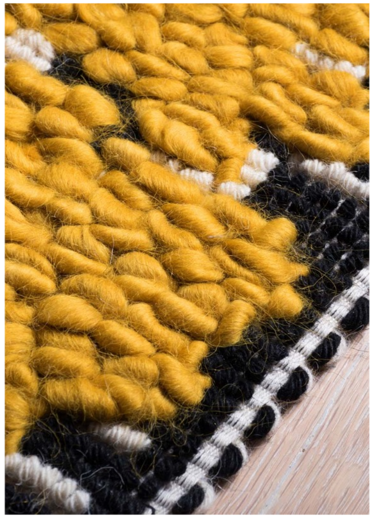
Fields Acoustic Panels

Acoustic modules are made from soft, foam like mycelium materials grown on upcycled textile residues. Thanks to the unique technology, Acoustic panels represent today the most sustainable solution dedicated to acoustic comfort. They are characterised by a unique velvety finishing and different 3D shape, to maximise sound absorption as well as aesthetic comfort.

FIELDS: Inspired by patches of cultivated land as seen from above, Fields features an irregular hexagon shape. Its soft, velvety surface is marked by delicate stripes, recalling the pattern of the seeding tracks. A calm texture, evoking a long-lasting collaboration between Humans and Nature. Despite their irregular shape, Fields modules allow for perfect tiling compositions, by means of a simple rotation of its geometry on one side. When adjacent, as in their standard configuration, the lines always meet each other, creating a visually ordered and elegant pattern

Non-GMO, non-allergenic fungal strains, which do not release any spores throughout the whole production process. The materials have been tested for allergenic and VOC Emissions





Pibiones

Pibiones technique is realised through the use of bars to which a large wool weft is wrapped around. This passage creates a very compact curl, reminiscent of a small grape, which in the dialect of Sardinia is called “Pibione”. The result is a very heavy fabric, 5 to 10 mm thick- depending on the size of weft and irons, characterised by a dotted texture.

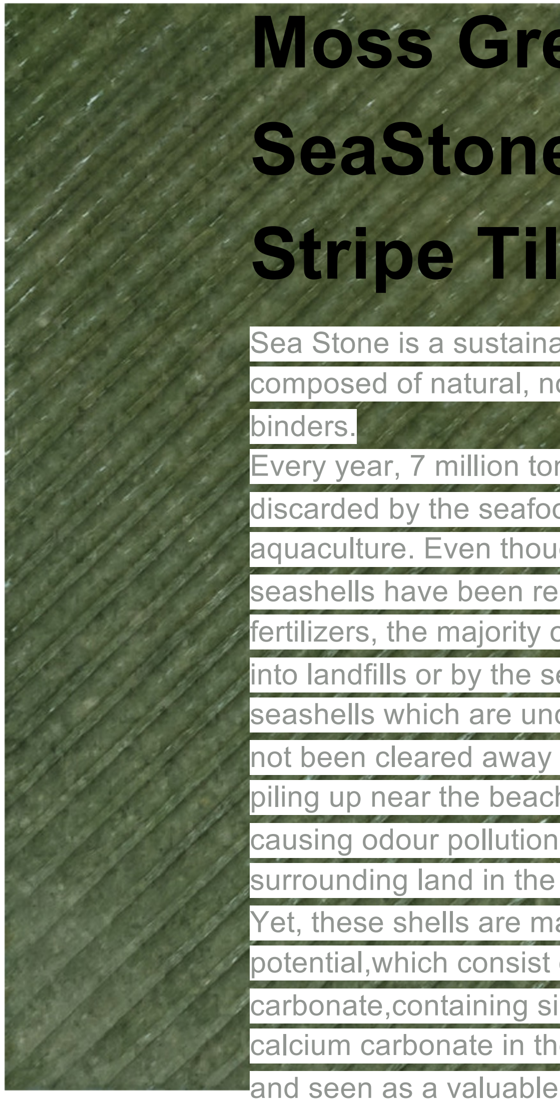
Thermafleece acoustic insulation is a greener alternative to normal Rockwool type acoustic mineral wool and is manufactured in the UK using sheep's wool. It offers first-class acoustic performance in cavities of buildings whilst minimising impact on the environment.

Hemp Block

Hemp blocks are unique bio based construction bricks that combine insulation and thermal mass properties. It contains probiotics, hydrated dolomitic lime, and hemp shiv.

Respecting the principles of social and environmental sustainability, it possesses all of the characteristics required of a sustainable building material: high insulating capacity, low embodied energy, and the ability to absorb CO_2 from the atmosphere.

With the monobloc solution or by filling an empty cavity with insulating interposition, it can be used to construct an insulating masonry wall for the building envelope.



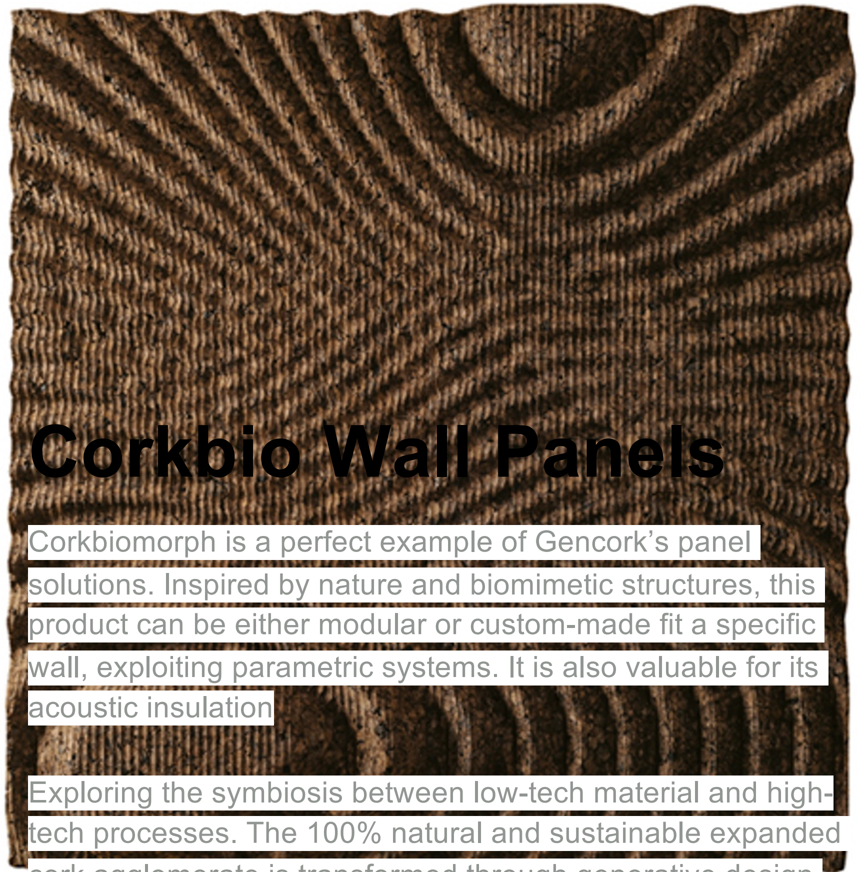
Moss Green SeaStone 3D Stripe Tiles

Sea Stone is a sustainable material that is composed of natural, non-toxic ingredients and binders.

Every year, 7 million tons of seashells are discarded by the seafood industry and aquaculture. Even though some of the seashells have been recycled and used as fertilizers, the majority of them are being thrown into landfills or by the seaside. The discarded seashells which are uncleaned or rotten have not been cleared away at all and have been piling up near the beach for a long time, thus, causing odour pollution and polluting the surrounding land in the long run.

Yet, these shells are materials with high potential,which consist of over 90% calcium carbonate,containing similar to the one of what calcium carbonate in the limestone contains and seen as a valuable biomaterial

Project 'Sea Stone' proposes the use of discarded seashells to create environmentally and economically sustainable material rather than contributing to the world's rubbish problem. The method is currently carried out manually to avoid the use of heat, electricity and chemical treatments and ensure the process is a sustainable and affordable as possible. Moreover, it is expected to positively impact three effects such as reducing waste disposal costs, preventing marine pollution, and recycling waste by creating value-added products with artistic, aesthetic, and functional new uses



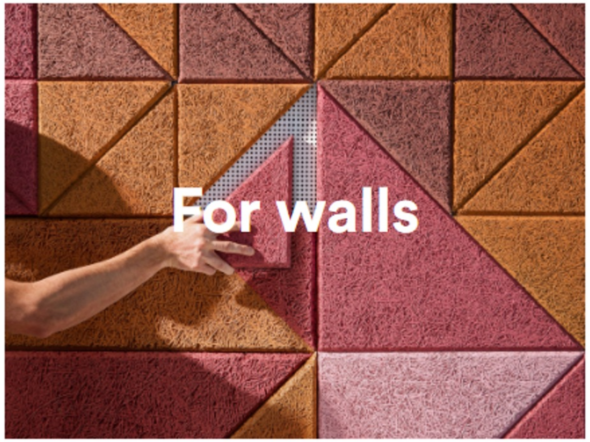
Corkbio Wall Panels

Corkbiomorph is a perfect example of Gencork's panel solutions. Inspired by nature and biomimetic structures, this product can be either modular or custom-made fit a specific wall, exploiting parametric systems. It is also valuable for its acoustic insulation

Exploring the symbiosis between low-tech material and high-tech processes. The 100% natural and sustainable expanded cork agglomerate is transformed through generative design algorithms and advanced digital fabrication processes, expressing a new formal aesthetics. This creative and disruptive system not only optimizes cork's thermal and acoustic properties but also adds artistic value to traditional walls.

Cursed by sound. Liked by architects. Loved by nature.

Discover our wide range of acoustic products:



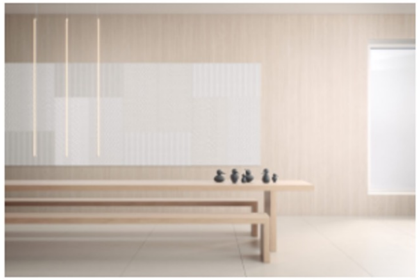
BAUX Acoustic Wood Wool Panels & Tiles contain two of the world's oldest building materials, the combination is simple and ingenious. BAUX Acoustic Pulp Panel is the first in the world to uncomprisingly combine true sustainability with functionality.

BAUX Acoustic Wood Wool Ceilings is the sustainable and acoustically outstanding option for ceilings. It's optimised for installations standards, easy to cut, crop and adapt and has boundless colour options.

BAUX Acoustic Flexfelt Screens is the most sustainable felt product on the market yet. This complete system of floor and desk dividers offers a wide range of colours and designs for any office space.

Οι πλάκες ξυλόμαλλου Heraklith προσφέρουν μηχανική αντοχή, θερμομόνωση, ηχομόνωση / ηχοαπορρόφηση, με εξαίρετη αντίδραση στη φωτιά. Ένα υλικό με βάση το ξύλο, το οποίο δεν επηρεάζεται από υψηλή υγρασία. Οι πλάκες ξυλόμαλλου Heraklith είναι ελαφριές, εύκολες στην τοποθέτηση με εξαιρετική πρόσφυση στο μπετόν. Έχουν μεγάλη αντοχή στη θραύση και διάρκεια ζωής. Διατίθεται κατά παραγγελία και σε μορφή με γωνία 45% στα άκρα. Αντίδραση στη φωτιά: κατηγορία A2-s1, d0 κατά EN 13501-1.

https://www.knaufinsulation.gr/proionta/heraklith-a2-c













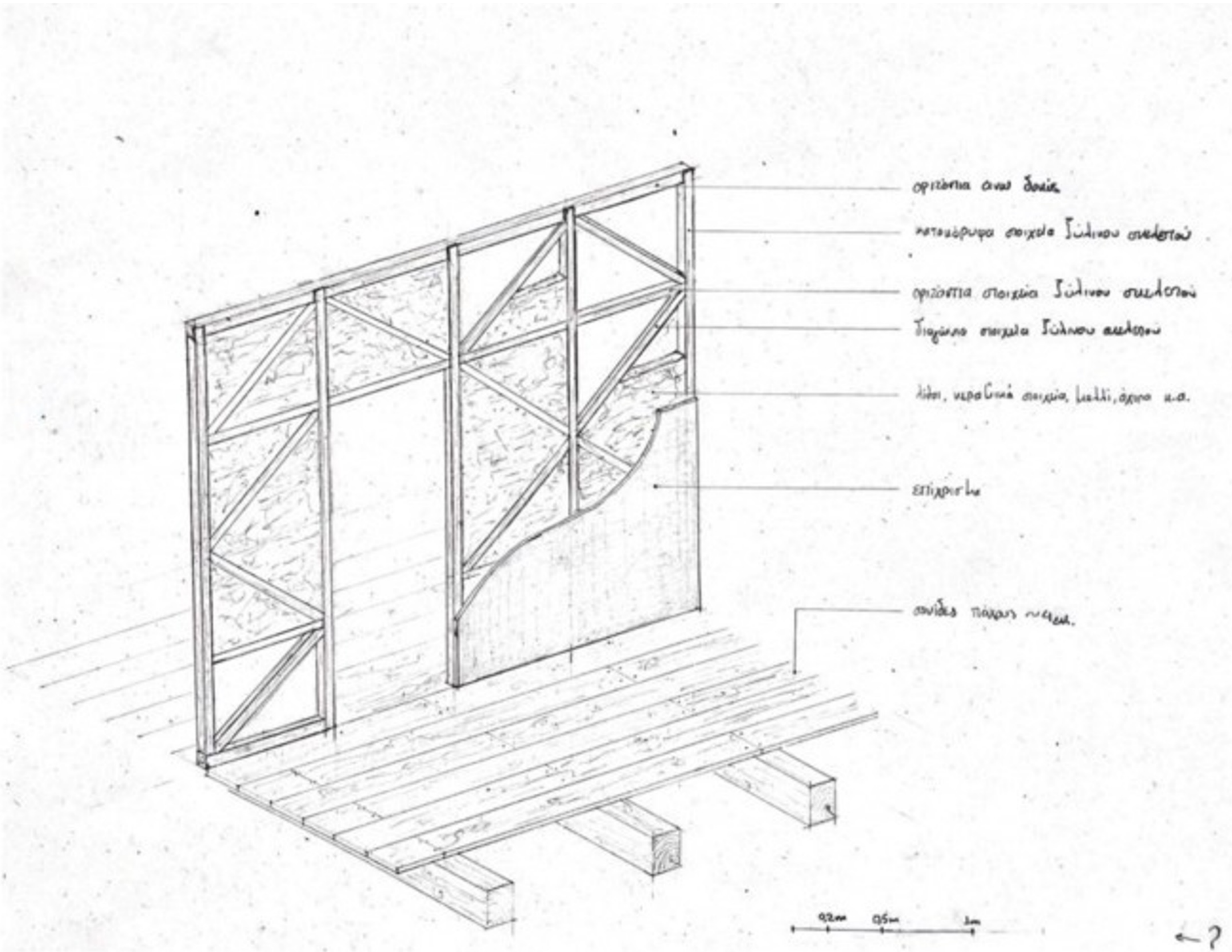







Ο **τσατμάς** αποτελεί κατασκευή, απαραίτητη για τη διαμόρφωση των εσωτερικών τοίχων.

Γενικά, κατασκευάζεται ένα ξύλινο πλαίσιο με οριζόντιες, κατακόρυφες και πλάγιες ξύλινες δοκούς, το οποίο πληρώνεται με λίθους, κεραμικά στοιχεία, μαλλί, αχύρα κ.α. Τέλος επιχρίζεται με τσιμεντοκονία.



http://5a.arch.ntua.gr/project/18368/19363

- Τσατουμάς ή τσατμάς: ξύλινο διαχωριστικό με επίχρισμα και από τις δύο πλευρές (σοβάς).

<u>παραλλαγή</u>: τοποθέτηση υλικού ανάμεσα σε δύο σειρές ξύλων για καλύτερη μόνωση.Αυτό το υλικό συνήθως είναι άχυρο ή μαλλί από κατσίκες.

- Μισάντρα: τύπος ξύλινου διαχωριστικού τοίχου (δεν προσφέρει τόσο καλή μόνωση όσο ο τσατουμάς).Υπάρχουν περιπτώσεις που η μισάντρα χρησιμοποιείται για ψευδοροφή.

http://5a.arch.ntua.gr/project/18368/19363

A03 – Architectural Implementation Study ? Αρχιτεκτονική μελέτη εφαρμογής ;

Η αρχιτεκτονική μελέτη εφαρμογής (ΜΕ) είναι το σύνολο των σχεδίων που αφορά τις κατασκευαστικές λεπτομέρειες, τα χαρακτηριστικά των υλικών και τις μεθόδους κατασκευής του έργου. Αποτελεί αναπόσπαστο τμήμα της Αρχιτεκτονικής Μελέτης, ενώ ο σκοπός της είναι να καλύψει κάθε κατασκευαστική πτυχή του έργου, μέχρι την παράδοσή του.

The architectural application study (AIS) is the set of drawings concerning the construction details, material characteristics and methods of construction of the project. It is an integral part of the Architectural Design, and its purpose is to cover every construction aspect of the project up to its delivery.

stru

A03 ?

Η αρχιτεκτονική μελέτη εφαρμογής αναλύεται στις παρακάτω φάσεις:
1.Λεπτομερής Σχεδιασμός
2.Τεχνικές Προδιαγραφές
3.Χρονικός Προγραμματισμός

1. Λεπτομερής Σχεδιασμός
Ο λεπτομερής σχεδιασμός είναι το στάδιο όπου εκπονούνται τα κατασκευαστικά σχέδια (π.χ. κατόψεις και όψεις λουτρών, κατασκευαστικές λεπτομέρειες δαπέδων, ξυλουργικών, τοιχοποιίας, ξηράς δόμησης κλπ.).

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A03 ?

1. Λεπτομερής Σχεδιασμός

Ενδεικτικά λοιπόν, ο λεπτομερής σχεδιασμός συνίσταται στην παρακάτω λίστα σχεδίων:

Αρχιτεκτονικά

•Διάταξη Περιβάλλοντος Χώρου σε Κλίμακα 1/50 ή 1/100 ή 1/200
•Διάγραμμα Εκσκαφών σε Κλίμακα 1/50 ή 1/100
•Κατόψεις όλων των Στάθμεων σε Κλίμακα 1/50
•Όψεις Κτηρίου σε Κλίμακα 1/50
•Τομές Κτηρίου σε Κλίμακα 1/50

As an example, the detailed design consists of the following list of plans:

Architectural
- Architectural Architecture - Layout of the Surrounding Area in 1/50 or 1/100 or 1/200 Scale
- Excavation diagram at 1/50 or 1/100 scale
- scale plans of all levels 1/50
- Building elevations at 1/50 scale
- Building sections in 1/50 scale

Maybe for your pavillon, you need to draw at 1/20, 1/10 or 1/1 scale.

From A02 to A03

Structure
the structural elements (walls, floors, etc.) ensure the stability and resistance of the building under the effect of loads (gravity, wind, earthquake, etc.)
Δομή
Τα δομικά στοιχεία (τοίχοι, δάπεδα κ.λπ.) εξασφαλίζουν τη σταθερότητα του κτιρίου και την αντοχή του στις επιδράσεις των φορτίων (βαρύτητας, ανέμου, σεισμού κ.λπ.).

Non-structural Elements
non-structural elements (chimneys, partitions, façade elements, suspended ceilings, etc.)
Μη δομικά στοιχεία
μη δομικά στοιχεία (καμινάδες, χωρίσματα, στοιχεία πρόσοψης, ψευδοροφές κ.λπ.)

Ενδεικτικά λοιπόν, ο λεπτομερής σχεδιασμός συνίσταται στην παρακάτω λίστα σχεδίων:

Κατασκευαστικές Λεπτομέρειες:

•Τομή Οπτοπλινθοδομές – Σενάζ
•Τομή Οπτοπλινθοδομές με Ηχομόνωση
•Τομή Ξηρά Δόμηση (Τοιχοποιίας διπλής, Επένδυσης, Ψευδοροφής, Κρυφών φωτισμών)
•Τομή Θερμομόνωση Δοκών – Υποστυλωμάτων
•Τομή Θερμομόνωση – Υγρομόνωση Υπογείων και/ή Φυτεμένων Δωμάτων
•Τομή Δαπέδου Ενδοδαπέδιας Θέρμανσης
•Τομή Υγρομόνωση Τοιχείων Υπογείων και Θεμελιώσεων
•Τομή Υγρομόνωση Κολυμβητικών Δεξαμενών
•Τομή Επιστρώσεις Δαπέδων
•Τομή Επιστρώσεις Δαπέδων Λουτρών και WC
•Όψη και Κάτοψη Επικαλύψεων Λουτρών και WC
•Τομή Επιστρώσεις Δαπέδων Κλιμακοστασίων και Πλατύσκαλων
•Τομή Επιστρώσεις Δαπέδων Εξωστών και Βεραντών
•Τομή Δάπεδα Υπογείων Αποθηκών και Μηχανοστασίων
•Κάτοψη Όψη και Τομή Ερμαριών Υπνοδωματίων, Κουζινών, Λουτρών, πάγκων

… The details must be proposed by each group according to the originality of their pavilion.

Οι λεπτομέρειες πρέπει να προτείνονται από κάθε ομάδα ανάλογα με την πρωτοτυπία του περιπτέρου της.

2. Τεχνικές Προδιαγραφές

Το τεύχος Τεχνικών Προδιαγραφών είναι τα πρότυπα της κατασκευής και το σύνολο των απαιτήσεων τις οποίες ακολουθούν όλα τα εμπλεκόμενα μέρη του έργου. Αποτελείται από τα παρακάτω παραρτήματα:

•Υποχρεώσεις Αναδόχου
•Προδιαγραφές Υλικών
•Κανονισμοί και Πρότυπα
•Πλάνο Υλικών και εγκατεστημένου εξοπλισμού
•Μεθοδολογία για κάθε στάδιο της κατασκευής

2. Technical Specifications

The Technical Specifications are the standards of construction and the set of requirements that all parties involved in the project follow. It consists of the following annexes:

Contractor's obligations
Material Specifications
Obligations of the Contractor Specifications of Contractor's Requirements
Material and Equipment Schedule
Methodology for each stage of construction