ACOUSTIC DESIGN GUIDE • VIDEO CONFERENCE ROOMS

Acoustic Telehealth Design Telemedicine Guide Video conferencing

Ecophon® SAINT-GOBAIN

A SOUND EFFECT ON PEOPLE

THE GUIDE

This guide contains a quick and accessible introduction to the most important acoustic design aspects of rooms used for telehealth – meaning rooms with video and audio equipment. The primary function of rooms designed for telehealth is to provide optimal conditions for remote doctor/healthcare professionals/ patient communication.
A room with good acoustics should support an often vulnerable situation where a patient meets a healthcare professional and the acoustics should be an advantage for both patients and clinicians.

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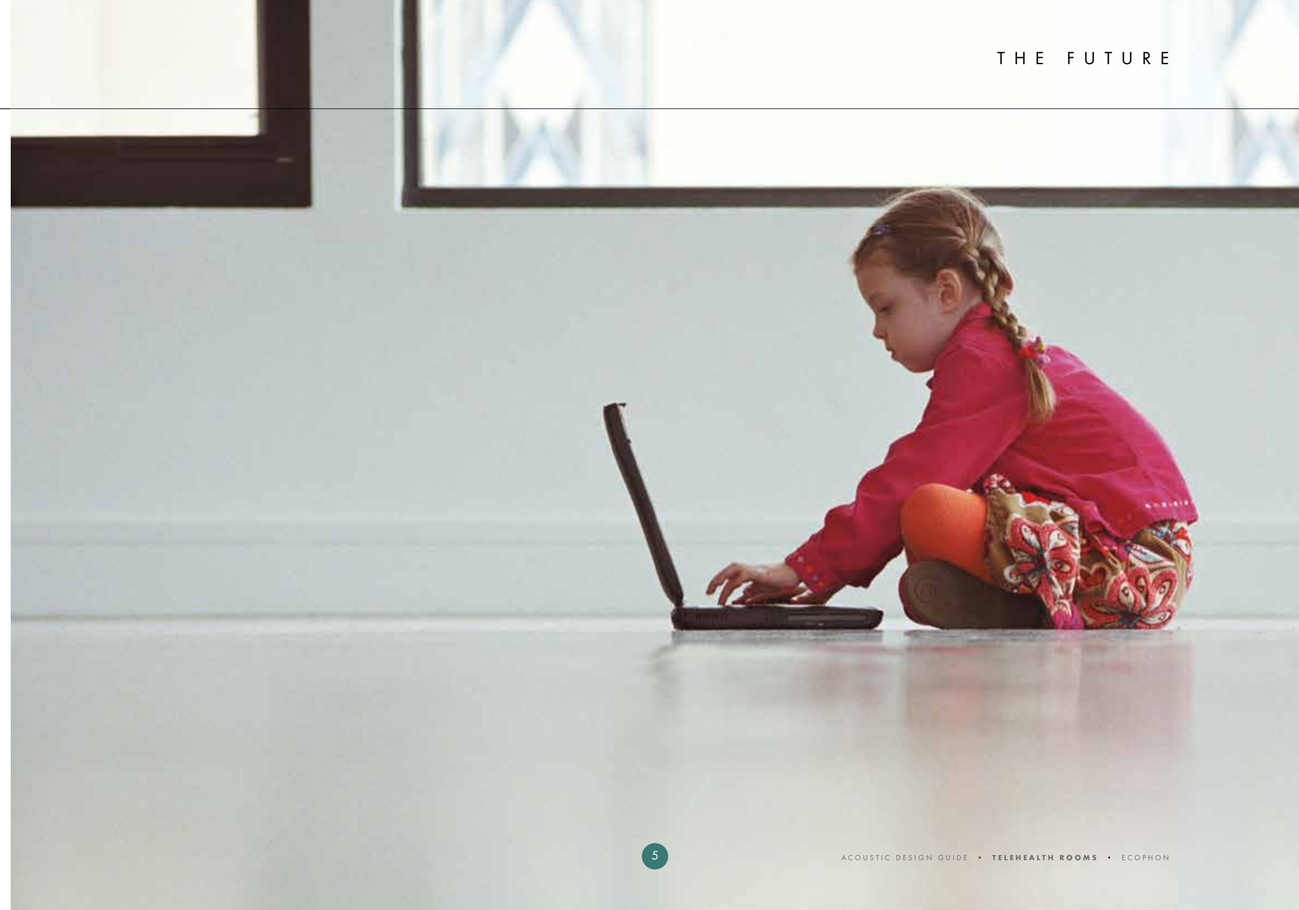
TELEHEALTH FOR A BETTER FUTURE

2020 was the first time in history when more professional interactions took place digitally than face to face. It is clear that this type of communication has come to stay and will become a regular part of professional life. Luckily it holds great potential for healthcare, sustainability and people in general. At the same time this technology also presents some challenges, as our patient/healthcare professional meeting now have to accommodate this new way of interacting.

The rise in online consultations has given patients an opportunity to contact clinicians faster and easier. When you are sick you are in a vulnerable situation and with telehealth a lot of challenging steps can be skipped; you can stay at home where you feel safe and comfortable.

Telehealth is not only good for the individual; reducing time spent in transit can reduce CO_2 emissions, air pollution, the risk of traffic accidents, wear and tear on roads and cars, and in some cases simply reduce or change the need for traditional healthcare space.



THE CHALLENGES OF TELEHEALTH

As in many other architectural domains, acoustics in rooms for audio and/or video conferencing has a tendency to be overlooked. Despite being called "video conferencing,"' audio is actually the most important aspect of this technology. When looking at video conferencing studies unfortunately:

- Audio problems are the main issue reported from video conferences (1).
- 46% of video conference users report that audio quality detracts from interaction (2).
- Age-related hearing loss (presbyacusis) causes communication problems for approximately 37% of people between the ages of 61 and 70.

This prevalence rises to 60% for people aged 71 to 80 (3). Since these age groups are expected to use telehealth the most, the audio is of high importance.

In the following pages we will give you a quick and easy introduction to relevant issues concerning video spaces designed for telehealth. It should be noted that acoustics is always best considered at the start of the design phase for any project, but especially in the case of rooms where on-line communication is a key component!

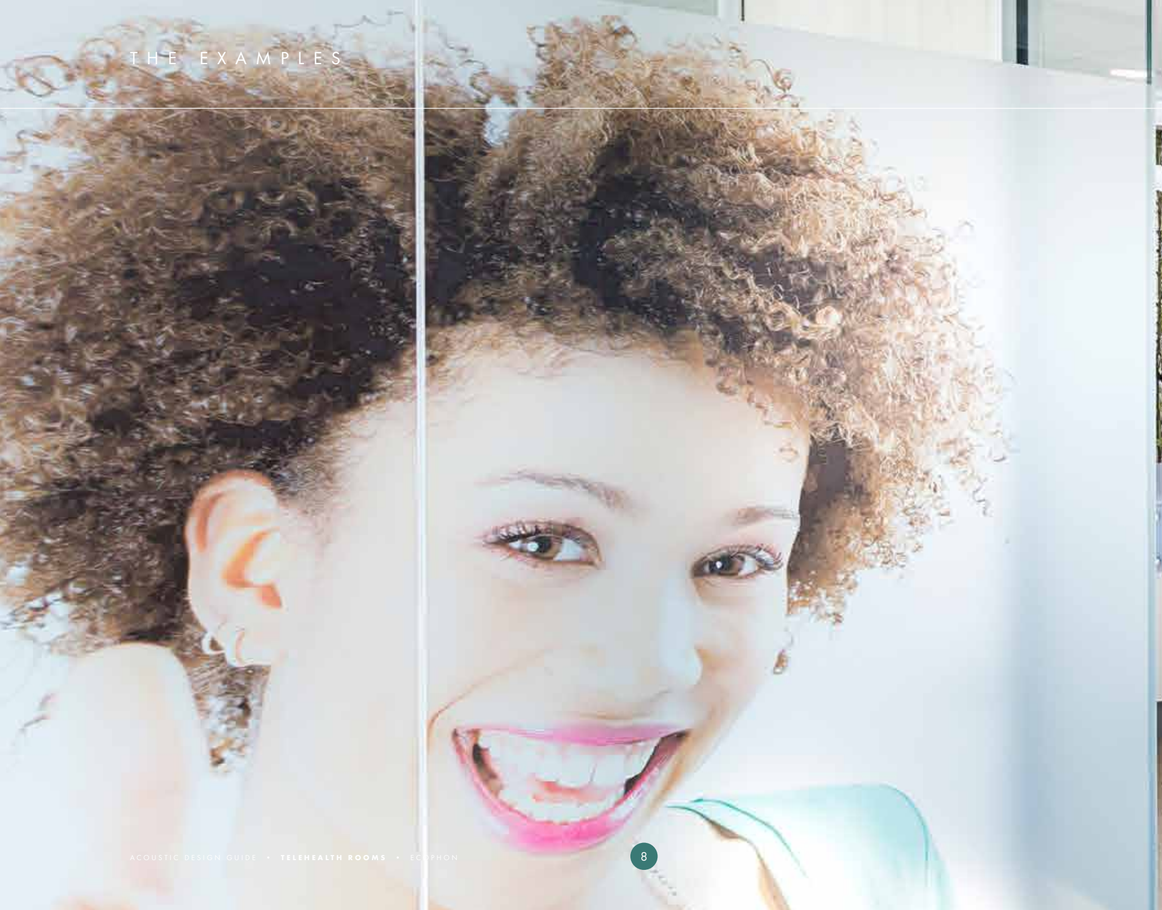
(1) Owl Labs: "State of Video Conferencing 2019." Report, Ogilvys Behavioural Science Practice.
(2) Erin Wolfe: "Video Conferencing Statistics for 2019." Web Article, Lifesize.
(3) Baur et al., Einfluss exogener Faktoren auf Altersschwerhörigkeit, HNO 2009, Springer Medizin Verlag 2009, p1023–1028

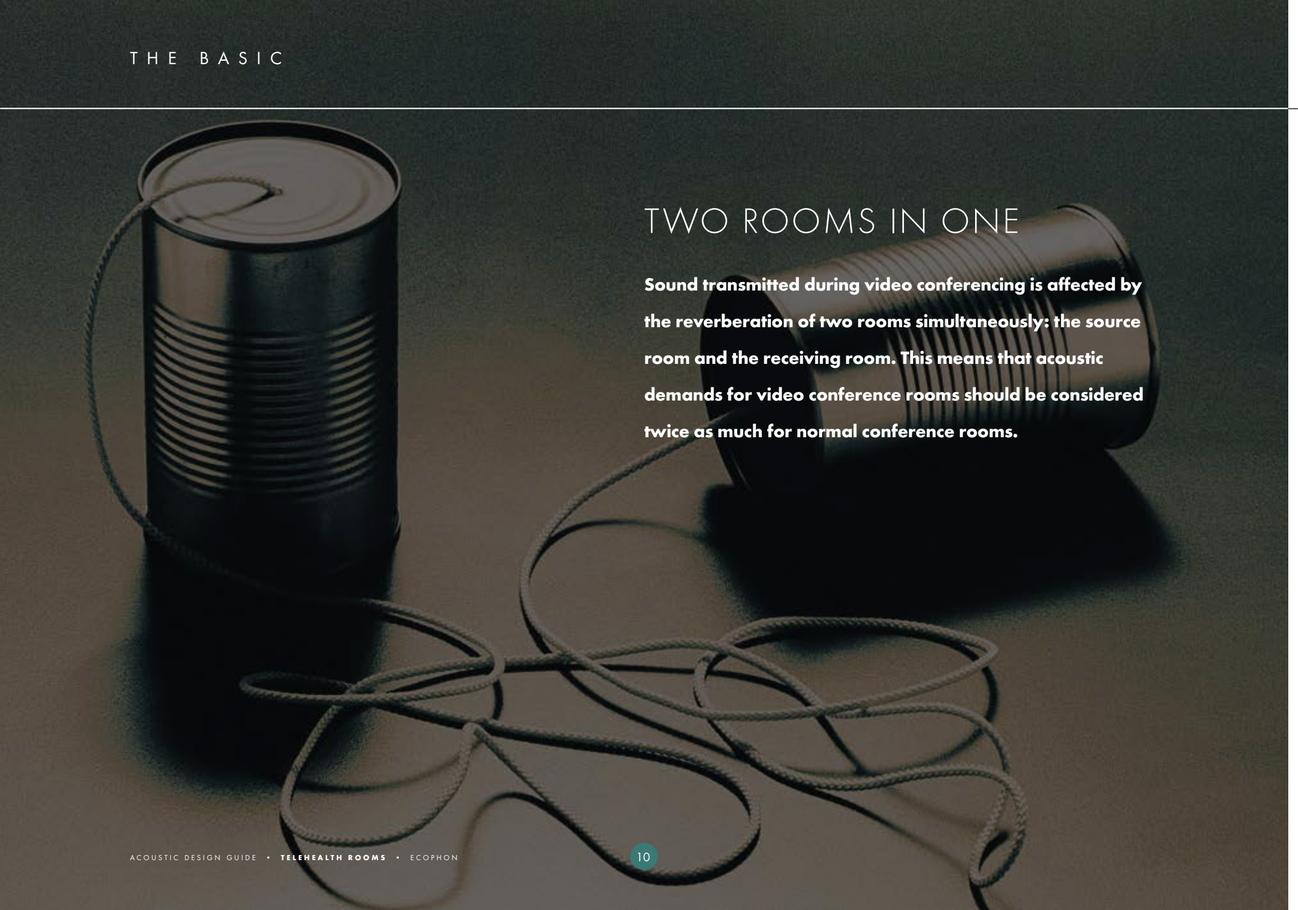
ACOUSTICS OF VIDEO CONFERENCE ROOMS

Reverberation is the phenomenon of sound waves being reflected between surfaces in a room. This generates noise and degrades clarity of speech. Reverberation is primarily mitigated by installing materials that absorb sound energy.

This is a waveform representing the words one, two and three with no reverberation. Notice the empty spaces between the waves.

This waveform represents the exact same words, but affected by reverberation. You can clearly see how their shape has changed and how the separation of the words is now blurred – software cuts the "tail" of the reverberation digitally, but the speech clarity is still heavily degraded.





TWO ROOMS IN ONE

Sound transmitted during video conferencing is affected by the reverberation of two rooms simultaneously: the source room and the receiving room. This means that acoustic demands for video conference rooms should be considered twice as much for normal conference rooms.

DEMANDS

From an acoustic perspective, a room used for telehealth must fulfil three purposes at the same time. It must be:

A good meeting room

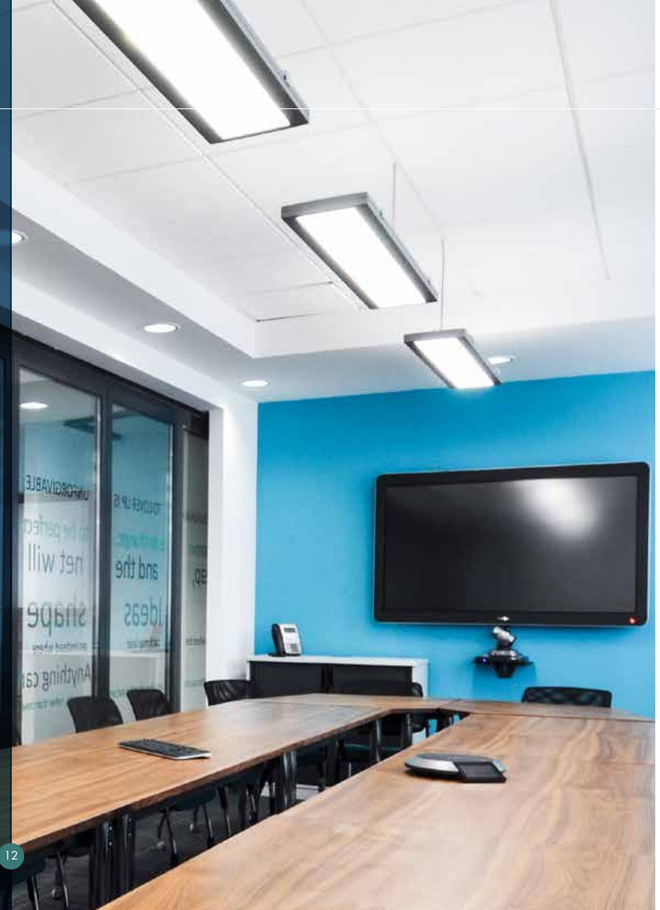
A good recording room

A good listening room

High acoustic demands are basically met by considering the acoustic characteristics of all surfaces in the room, to minimize reverberation and increase speech clarity.

ACOUSTIC CONSIDERATIONS

Rooms for telehealth and video conferences should have some of the highest acoustic demands of any room type found in a normal healthcare facility. Very often this room is also used as the normal meeting room or consultation for clinicians and the variation of activities should therefore be considered as a part of the acoustic design. The guiding principle should be that all room surfaces should add to the acoustic treatment, if possible.



PLACEMENT OF ACOUSTIC MATERIALS

Ceiling

For the best results a fully covering suspended acoustic ceiling is recommended. This type of ceiling provides the highest degree of absorption over the entire frequency spectrum. Low frequencies (deep sounds) are particularly problematic in small rooms such as normal video conference rooms. Suspended ceilings are also the ideal way of handling this issue. In cases where a suspended ceiling would be impractical or undesirable, other solutions can be implemented such as free-hanging units.

Walls

Roughly speaking, at least one of every pair of opposing walls should be treated with class-A acoustic material. Lesser absorbing materials, such as curtains, should also be considered.

Geometry

As a general rule of thumb, a more asymmetrical room geometry will provide better acoustic conditions if absorbing materials are already present. Slanted or curved surfaces affect the direction of sound waves and ensure they are not reflected back and forth between parallel surfaces.

PLACEMENT OF ACOUSTIC MATERIALS

Scattering

Much like an asymmetrical room shape, rough and uneven surfaces will also improve the acoustic conditions when used in conjunction with highly absorbing materials, as they scatter the sound and prevent reoccurring reflections between parallel surfaces.

Sound Insulation

Insulation from the ambient sound environment is important for both the audio/visual interaction and to ensure speech privacy for sensitive matters. It is recommended that only the most effective sound-insulating methods are utilised in the construction of video conference rooms.

In cases where walls only extend to the height of a suspended ceiling, special care should be taken to maximise sound insulation from adjacent spaces.

TELEHEALTH AND TELEMEDICINE

Very often consultations take place in an ordinary room for examination or treatment in an outpatient clinic or in a hospital. Very often this room also functions as the doctor's office where documentation, communication and performance is key.

The healthcare professional cannot control the room and audio equipment of the patient which sets even higher acoustic demands for the professional's room. Room acoustic treatment on several surfaces is needed to secure clear speech from the healthcare professional to the patient to minimize misunderstanding and mistakes.

If the healthcare professional is placed in a call center potential background noise also has to be considered. Acoustic zones that allows communication without disruptions from other people's speech can be secured by adding acoustic sound absorbers on screens, walls and ceiling.

Always consult with your provider of audio/visual equipment about the needs for each specific room design you are working with.

Acoustic treatment in this room

This room is typically what rooms for telehealth look like. It is a doctor's office and examination/treatment room that also allows for digital and telephone consultations. The room acoustic solution should therefore support various acoustic events where either one or several sound sources will affect the listener and communication.

A suspended acoustic and hygienic ceiling is highly important to avoid reverberance and sound building up. Acoustic wall panels should also be part of the optimum solution to avoid late sound reflections that interfere with clear speech.

THE EXAMPLES

TERMS USED IN ACOUSTICS

Reverberation time (ISO 3382-1+2)

Reverberation time is the most basic room acoustic parameter and specifies the time period it takes for sound energy to dissipate in an enclosed space. Roughly speaking, the longer reverberation time, the noisier a room will be and the less intelligible speech will be. Reverberation time is specified for several frequency bands as materials interact differently with sound at different frequencies. The reverberation time primarily depends on the room size relative to the amount of highly sound-absorbing material present, along with the shape of the room and interior design.

Speech Clarity (ISO 3382-1)

The primary function of a video conference room is to transmit speech from sender to receiver as clearly and seamlessly as possible. The acoustic descriptor Speech Clarity is a useful measure of ensuring this function.

High speech clarity ensures easy communication for both speaker and listener. The speaker should be able to use their natural vocal range, speech patterns, inflections, head movements etc. The listener should be able to pick up all cues from the speaker without having to concentrate excessively, compensating for delay, etc.

THE TOOLS

TERMS USED IN ACOUSTICS

Low frequencies and small rooms

Put simply, lower frequencies (deeper sounds) are more likely to reverberate in smaller rooms such as video conference rooms. Which frequencies are determined by the specific geometry and size of any given room. If not treated acoustically these frequencies can cause an unbalanced sound environment and affect speech clarity. It is therefore important to take this into account when choosing acoustic materials for video conference rooms. These materials should be as effective at absorbing low frequencies as possible relative to how much space they take up.

Flutter Echo

Flutter echo is a phenomenon caused by sound waves being reflected between parallel hard surfaces over a short time span. This can cause a very fast echo that can cause discomfort and fatigue in longer meetings while also degrading speech clarity. The possibility of flutter echoes will not be uncovered by many types of acoustic calculations or simulations.
Flutter echo is handled by making sure that all parallel surfaces of the room in question have a degree of acoustic absorption or scattering.

THE HELPING HAND

GET TO KNOW US

Saint-Gobain Ecophon develops, manufactures and markets acoustic products and systems that contribute to a good working environment by enhancing peoples' wellbeing and performance. Our promise »A sound effect on people« is the core backbone of everything we do.

Ecophon has been involved in international studies and gathering acoustic knowledge for more than 50 years. The most important information has a dedicated place on our website and is freely accessible to everybody. Here you can also meet our acoustic experts. Their objective – to spread knowledge and help anyone who requests assistance.
We also have a global platform for fellow enthusiasts, Acoustic Bulletin, where we write posts and exchange knowledge.

Let's Connect
We are worldwide! Ecophon has business units in 14 countries, delegations in another 30 countries, and approximately 800 employees. Find your local contact here.

By following us on Social Media you stay abreast of all the latest acoustic findings, acoustic research and product development, and can also see inspirational new reference cases.

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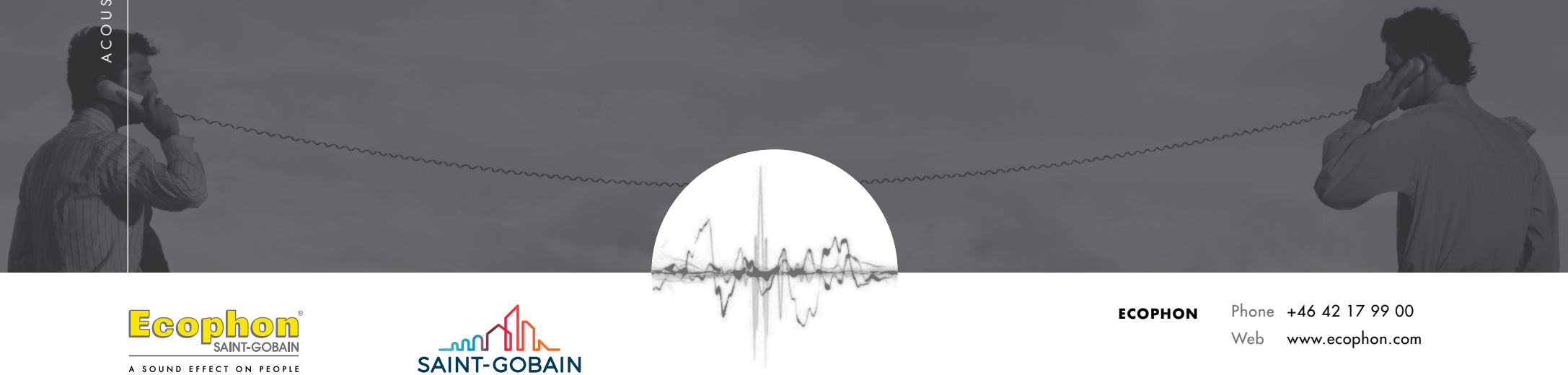

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