Enhance care and recovery

with Activity Based Acoustic Design

Ecophon®
SAINT-GOBAIN
A SOUND EFFECT ON PEOPLE

Bring the outdoors in

to enhance wellbeing and performance

Over hundreds of thousands of years, our ears have evolved for us to hear perfectly outdoors, in nature. But today most of us spend up to 90 per cent of our time indoors. For more than 50 years Ecophon has been on a mission to spread awareness of the importance of creating indoor environments that resemble what we experience in nature.

So, what do you need to consider when designing a healthcare environment? Well, the first thing is that people will carry out a vast variety of activities in this environment. At any given time there will be patients resting, sleeping and recovering; staff attending to care recipients; nurses and doctors performing medical treatments; people moving around; conversations in person and on the phone, teams working together; and many tasks that demand concentration.

All these activities require their own acoustic solution. We call this Activity Based Acoustic Design. Our solutions support the activity taking place and thus enhance staff motivation, performance and job satisfaction, as well as patients' and residents' comfort and ability to rest and recover.

The sustainable choice

We take responsibility for the whole life cycle of our products, and they are sustainable in every respect. All our absorbers are made with the unique 3rd generation glass wool, in which we combine more than 70 per cent recycled glass with a plant-based binder. The water-based paint is made without any harmful additives. We use renewable energy in our facilities and the CO_2 emissions per absorber are most probably the lowest in the business. We turn our production waste into pellets that are used for drainage, and our recycling programme guarantees that once the 3rd generation glass wool absorbers have done their job, we will take them back and turn them into new products.

When it comes to the indoor environment you can rest assured that our systems are completely safe. They don't need any maintenance except cleaning and will stand the test of time. All absorbers meet the toughest indoor standards and we have the certificates to prove it. We are also recommended by the Swedish Asthma and Allergy Association.

Ecophon – a sound effect on people.

Idea and layout: Saint-Gobain Ecophon AB. Printer: Skånetryck AB.
Cover: Rickard Johnsson/Studio-e.se, Illustrations: Citat AB

Activities Challenges Solutions

Activity Based Acoustic Design

improves healthcare outcomes

Are you in a healthcare facility right now? Please take a look around. Listen. Do you hear people talking on the phone? Do you hear conversations that are not relevant to you? Do you hear machines or ventilation fans? Do you hear alarms? Do you feel that these things disturb you and make you feel more stressed? If so, you are not alone. One of the most disruptive and stressful things people experience in healthcare facilities is sound that you don't want to hear. Or in one word – noise.

Healthcare facilities are a lot different than say an office building. The primary reason is that there are two main groups of people in healthcare: care givers and care recipients. These two groups have totally different activities to perform and it is therefore of utmost importance that you design a facility where both can do what they are supposed to.

For staff this means a lot of things. They need to perform examinations and procedures, which often include the use of very loud medical equipment and machines. They need to be able to have confidential conversations without the risk of others overhearing. They have to be able to concentrate on their tasks and clearly hear medical judgements and prescribed medication dosages. If they don't, people's lives may be at risk.

If you are a recipient of care, you are in an environment that you really can't influence. You have no choice but to cope with where you are. But in order for care to be truly successful, you should be in an environment where you feel safe and where you can rest, sleep and recover. Since many of the patients in hospitals are older than 60, the environment also needs to be designed to meet the needs of the elderly ear.

1 Activity

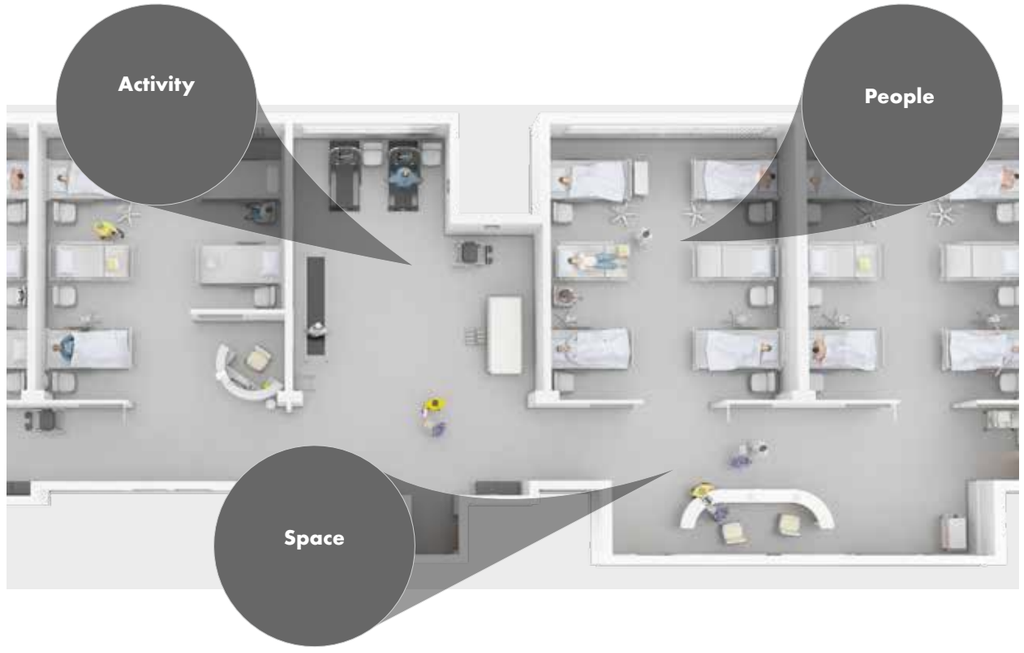
What will people be doing in the space, both the staff and the care recipients? Will it be noisy? Will it include the use of equipment and machines? Is confidentiality an issue? How much time is spent communicating?

2 People

Who is involved in the activity? Consider both staff and care receivers. How many are there, are they old or young? Do they have any special needs?

3 Space

Is the space big or small? Where is it situated, what spaces are next to it and what activities are performed there? Does the building have bare concrete walls, ceilings and floors? Are there fans, alarms or other frequent sounds in the space?



If you live in an elderly care unit it is both a healthcare facility and your home. You need to feel safe and comfortable, you need to be able to enjoy your private space, you need the environment to be adapted to your perception abilities and the elderly ear, so you can fully enjoy the company of others and hear what people are saying to you.

Supporting the activity

In order to create a space where people can perform a certain activity to the best of their ability, and feel good doing so, Ecophon has developed Activity Based Acoustic Design. This is a method for acoustically designing indoor environments. In practice, it means defining spaces from three perspectives – activity, people and space – and finding the common ground where all perspectives benefit. The solutions are then achieved using a combination of high-quality acoustic elements.

For instance, when you design a nursing ward in a hospital, you need to treat all the spaces in the ward as separate entities. A corridor is not the same as a treatment room or a shared space where patients eat and watch TV together. The activities differ, the people involved are not the same and the physical spaces are definitely different.

Healthcare facts

Benefits of a healthy sound environment

Studies show that a good sound environment dramatically increases the overall quality of care in healthcare facilities. The benefits include:

- Lowered blood pressure
- Improved quality of sleep
- Reduced intake of pain medication
- Improved communication
- Lowered stress levels
- Improved patient safety
- Enhanced staff wellbeing, performance and job satisfaction

It is quite astonishing that the acoustic solution can contribute to all this. And in addition to all the human benefits, think of what the benefits mean in terms of saving time and money.

[1] Weise, "Investigation of patient perception of hospital noise and sound level measurements: before, during and after renovations of a hospital wing", Architectural engineering – Dissertations and Student Research, 2010, Paper 4

[2] Hsu, Ryherd, Ackerman, Persson Waye, "Noise pollution in hospitals: Impacts on patients", J. Clin. Out. Mgmt. 2012, vol 19, no 7, p301-309

[3] M. Simon, P. Tackenberg et al., Evaluation of the first survey of the NEXT study in Germany, 2005

[4] Woloshynowych, Davis et al., "Communication patterns in a UK emergency department", Ann. Emerg. Med., Oct 2007, 50(4), 407-413

[5] Lena M. Berg, et al., An observation study of activities and multitasking performed by clinicians in two Swedish emergency departments; 2011

[6] Baur et al., Einfluss exogener Faktoren auf Altersschwerhörigkeit, HNO 2009, Springer Medizin Verlag 2009

Hospital and outpatient clinic facts

- High sound levels in healthcare facilities are known to: impair sleep, increase stress, delay post-illness rehabilitation, aggravate agitation, cause psychiatric symptoms, escalate restlessness, increase respiratory rates and increase heart rates[1]

- Sleep is fundamental to human health in general and critical to patient recovery. Alertness, mood, behaviour, coping abilities, respiratory muscle function, healing time and length of stay are just a few of the potential impacts of patient sleep disturbance or deprivation[2]

- Noise in emergency departments is regarded by 60.5% of staff as being "very" or "somewhat" burdensome.[3] 83% of all communication with a head nurse in an emergency department is speech related[4] 70% of medical errors in emergency departments can be traced back to "communication shortcomings" such as multitasking and interruptions[5]

Elderly care facts

- Age-related hearing loss (presbycusis) 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[6]

Mental health
Hospitals
Elderly care
Outpatient clinics

- Impaired hearing adversely affects spatial orientation and increases the risk of falling. Impaired hearing turns communication into a real effort and causes rapid fatigue/exhaustion. Frequent misunderstandings are known to lead to withdrawal, self-doubt, depression and dogmatism[7]

- The severity of hearing loss correlates with reduced cognition and an increased incidence of depression in old age[8]

- People who are cut off acoustically from the external world not only lose their hearing, they are at risk of becoming socially and intellectually isolated. The less stimulation the brain receives, the more quickly its capacity diminishes[9]

Mental health facts

- The most widespread and well-documented subjective response to noise is annoyance, which may include fear and mild anger, related to a belief that one is being avoidably harmed[10]

- Noise may reduce helping behaviour, increase aggression and reduce the processing of social cues[10]

- Noise is a factor that can contribute to fear and tension on a ward. Staff perform better in environments that feel safe, calm and spacious[11]

- Designs that have good acoustics, minimise the risk of crowding and have natural light and ventilation are important in helping to create a positive therapeutic atmosphere[11]

- A therapeutic environment is one where noise levels are adjusted to meet the needs of the people living there[11]

[7] Deutsche Seniorenliga e.V., Altersschwerhörigkeit – Symptome, Ursachen, Folgen, Diagnostik, Therapie, Ausgabe 2010; Cacciatore et al. 1999, Chia et al. 2007

[8] Cacciatore et al. 1999; Dalton et al. 2003, The impact of age-related hearing loss on cognition and psychological state

[9] Deutsche Seniorenliga e.V., Altersschwerhörigkeit – Symptome, Ursachen, Folgen, Diagnostik, Therapie, (Age-related hearing loss – symptoms, causes, consequences, diagnosis, therapy) Ausgabe 2010; Dalton et al., 2003; Chia et al., 2007; Chisolm et al., 2004

[10] Stansfeld et al., Noise pollution: non-auditory effects on health, British Medical Bulletin 2003; 68: 243–257

[11] United Kingdom Department of Health, "Health Building Note 03-01: Adult acute mental health units", 2013.

Top:

Kliniken Maria Hilf, Germany

Photographer: Hans Georg Esch

Right:

Meander Medisch Centrum, Netherlands

Photographer: Lighthouse Productions Dirk Verwoerd

Feeling welcomed

and finding your way

The ideal entrances and break-out spaces are inviting, comfortable and stress-free. Patients and staff should easily be able to move around, have conversations, ask questions, wait for assistance and find their way.

But if acoustics is not given enough attention, the desired positive feeling can easily become a negative one. Sound will bounce off all the hard surfaces, leading to echoes and escalated sound levels. This will make people raise their voices, just to be heard. Increased sound levels can also result in sound spreading to adjacent areas, and they are known to cause older people to feel disoriented, leading to confusion and frustration.

Challenge: *To keep the overall sound level from escalating, to reduce echoes, to ensure privacy at the reception desk and to stop sound from spreading to other areas in the building.*

Solution: *The highest possible coverage of sound absorbers on ceilings and walls. Location-wise it is also recommended that these spaces are separated from areas that are especially sensitive to disturbing noise.*

Acoustic considerations:

Sound level and reverberation
(see page 30 for more information on acoustics)

Top:

Meander Medisch Centrum, Netherlands

Photographer: Lighthouse Productions Dirk Verwoerd

Right:

AWO Seniorenzentrum, Germany

Photographer: Hans Georg Esch

Relaxing

and enjoying a meal

A canteen or cafeteria is a place where people should be able to relax and enjoy both the food and the company of others. Speaking and listening comfort must be good so that everybody, including people with hearing loss, can participate in the conversations.

The typical canteen is a large open space with a high soffit. There are many conversations at the same time and there is constant noise from tableware and cutlery. People will be walking by the area or to and from their tables, chatting to friends while they walk. If left unattended, sound will bounce off hard surfaces, creating echoes that will spread in all directions. Sound levels will increase, creating a very stressful and uncomfortable environment.

Challenge: *To prevent the sound level from escalating and to keep sound from spreading in all directions and to adjacent areas.*

Solution: *Sound absorbers covering the ceiling and as much of the walls as possible. Absorbing screens are good to use for creating seating areas and as a divider between people who are eating and those walking past the canteen.*

Location-wise it is recommended that canteens are placed away from areas that are especially sensitive to disturbing noise.

Acoustic considerations:

Sound level and speech clarity
(see page 30 for more information on acoustics)

Top:

Notaufnahme UKSH, Germany

Photographer: Hans Georg Esch

Right:

Meander Medisch Centrum, Netherlands

Photographer: Lighthouse Productions Dirk Verwoerd

A comfortable

path to recovery

Corridors are busy and vibrant multipurpose areas in healthcare settings. Patients, residents in elderly care, visitors and staff move from one place to another and often have to move beds, medical equipment and other supplies. Most of the communication between staff occurs in corridors and at the nurses' stations. In the nurses' stations, staff also hold phone conversations and do a lot of paperwork.

Due to their elongated shape, corridors are like reverberant tubes in which sound, if it is allowed to, can travel long distances. This sound will affect every room along the corridor, sound levels will rise, sleep disturbance will increase, and people will have to raise their voices to be heard above the surrounding noise. Studies show that noise is one of the main causes of documentation errors.

Challenge: *To reduce sound levels, to prevent the corridor from transporting noise throughout the ward, and to improve speech clarity at nurses' stations.*

Solution: *Using a sound-absorbing ceiling with good absorption qualities and efficiency in reducing sound propagation. Wall absorbers wherever possible will reduce sound levels even further. Low, sound-absorbing, free-hanging units directly above the nurses' stations, combined with wall absorbers in the vicinity, will increase speech clarity and reduce sound propagation.*

Acoustic considerations:

Sound propagation, sound level and speech clarity
(see page 30 for more information on acoustics)

Top:

Notaufnahme UKSH, Germany

Photographer: Hans Georg Esch

Right:

Asklepios Klinik Barmbek, Germany

Photographer: Philips

Waiting

in comfort

When people are waiting to be attended to, it is important that they are in a relaxing and comfortable environment that will help to reduce any anxiety, worries or fears they might be experiencing. They and the staff should easily be able to have private conversations, without the risk of people overhearing.

Waiting areas are often either dedicated larger rooms or smaller spaces located within a corridor or an open space. A lot of waiting rooms have a counter where people can speak to a nurse or administrative staff. At any given time there will be people walking by and conversations by phone and face-to-face.

Challenge: *To absorb sound and prevent echoes, to improve speech clarity and keep sound from spreading throughout the space.*

Solution: *Using a high-performance, sound-absorbing ceiling and wall absorbers. If there is a counter, the wall absorbers should be placed on the walls close to the counter. Additional low, sound-absorbing, free-hanging units directly above the counter will increase speech clarity and privacy.*

Acoustic considerations:

Speech clarity, reverberation and privacy
(see page 30 for more information on acoustics)

Top:
Malmö Maternity Ward, Sweden
Photographer: Ole Jais
Right:
Notaufnahme UKSH, Germany
Photographer: Hans Georg Esch

Recovering

in peace and quiet

Rest and sleep are important parts of our health and everyday life, but they are never as important as when we are ill or have gone through an operation. They are crucial for our healing and recovery. The design of treatment and patient rooms should therefore enable privacy, comfort and good quality of sleep.

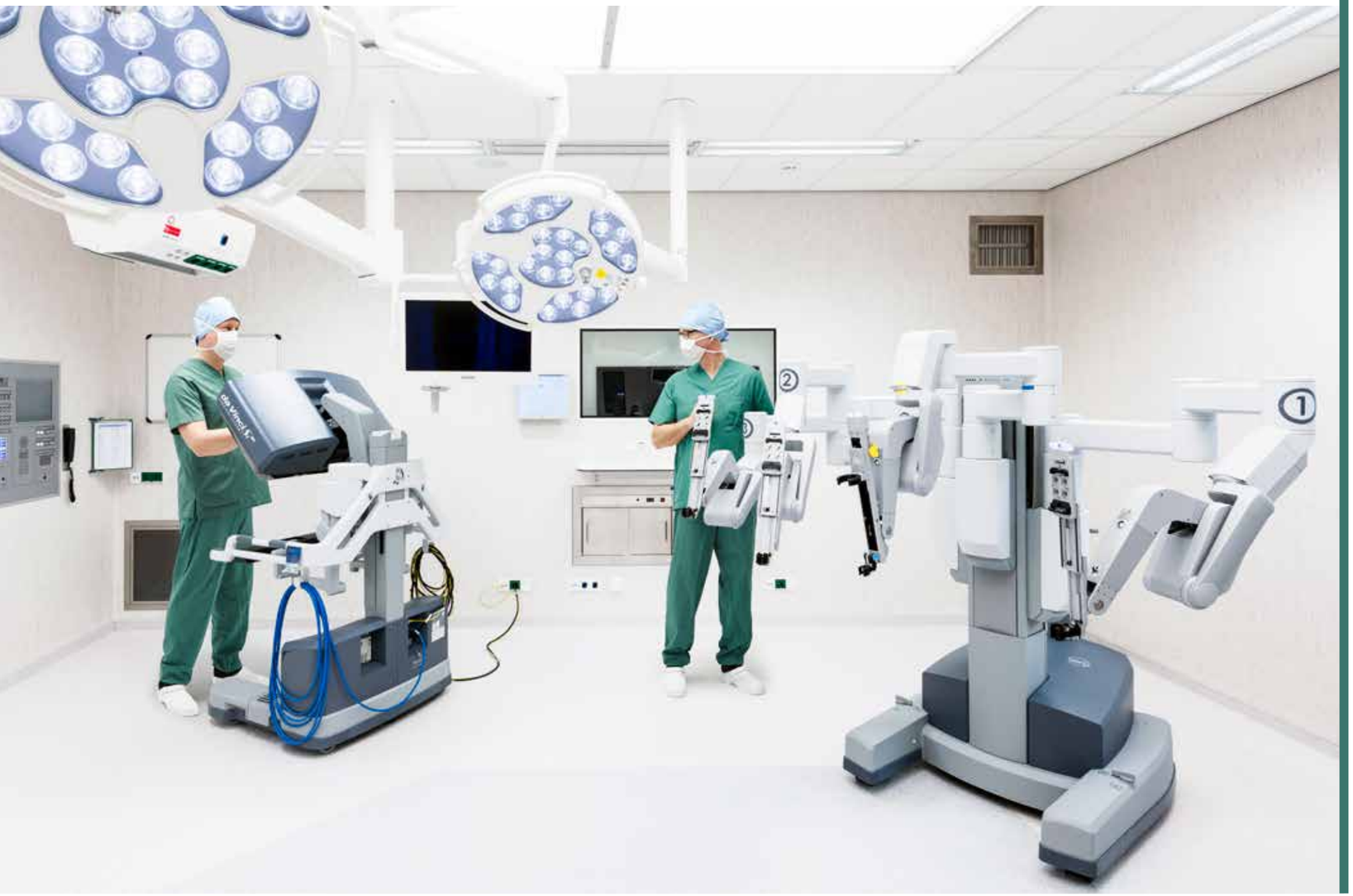
Patients should not be exposed to sound and noise that can cause negative feelings such as anxiety and stress. For the same reason it is also very important that the patient can easily hear what nurses and doctors are saying.

Challenge: *To ensure privacy, to enhance communication, to minimise the impact and effect of sound created inside the room, such as noise from equipment and speech, and to reduce noise from adjacent areas.*

Solution: *A very good sound-absorbing ceiling and wall absorbers on at least one wall. Good sound insulation between rooms as well as a sound-absorbing ceiling and wall absorbers in the corridor outside the room.*

Acoustic considerations:

Privacy and speech clarity
(see page 30 for more information on acoustics)



Top:

Meander Medisch Centrum, Netherlands

Photographer: Lighthouse Productions Dirk Verwoerd, Rickard Johnsson/Studio-e.se

Right:

Ortenau Klinikum, Germany

Photographer: Hans Georg Esch

When the highest

quality of care is critical

There are many specialist areas within a hospital that require both acoustic and hygienic considerations, such as operating theatres (OR), intensive care units (ICU) and maternity wards. Patients in these spaces are often in a critical condition, while doctors and nurses need to make decisions quickly and then clearly communicate medical assessments and instructions to others.

In an OR or ICU, there are often a lot of people and very loud equipment, with sound levels frequently reaching as high as 100 dB. In combination with hard ceiling, wall and floor surfaces, all this sound from equipment, people and alarms makes communication difficult and often leads to increased stress. Studies show that the risk of making medical errors escalates as the number and level of sounds rise.

Challenge: *To efficiently reduce the disturbance from equipment, to improve the healing environment, to keep general sound levels low, to improve communication between staff, and finally to do this without any risk to hygiene.*

Solution: *A high-performance sound-absorbing ceiling with suitable hygienic properties, particle repellence and/or air tightness. If possible, use wall absorbers to further reduce noise and improve speech clarity.*

Acoustic considerations:

Sound levels and speech clarity
(see page 30 for more information on acoustics)

Top:

Spain

Photographer: IBL Javier Larrea, Rickard Johnsson/Studio-e.se

Right:

Notaufnahme UKSH, Germany

Photographer: Hans Georg Esch

Safe performance

in a stressful situation

Medical judgements, treatment and medication dosages are always important, but in emergency units it is often vital that they are administered as quickly as possible. To ensure patient safety it is therefore essential that doctors and nurses can communicate clearly to each other. Patients are in a situation where they often experience stress, anxiety, shock and fear. They need to be in a calming environment where they can hear and understand information and questions from staff.

Emergency units are most often large open-plan spaces. There are often many people: nurses, doctors, patients and patients' family or friends. Staff will at any given time need to talk to each, treat people, move patients and bring in supplies and medical equipment. In addition to this, the emergency unit is in close proximity to the ambulance entrance, surgery department and emergency radiology. Escalating sound levels are very common and studies show that most medical errors in emergency units can be traced back to communication shortcomings.

Challenge: *To provide privacy, to reduce trauma and stress for patients, to improve communication between staff, to reduce sound levels and sound propagation.*

Solution: *A sound-absorbing ceiling with good absorption qualities and efficiency in reducing sound propagation. Wall absorbers wherever possible will reduce sound levels even further. Sound-insulating and absorbing screens help to improve local privacy.*

Acoustic considerations:

Sound level, sound propagation, speech clarity and privacy
(see page 30 for more information on acoustics)

Top:
Verpleeghuis Willibrord, Netherlands
Photographer: Petra Appelhof
Right:
Karolinska University Hospital, Sweden
Photographer: Philips

Sharing a good time

with others

Shared spaces such as living rooms, activity rooms, dining rooms and kitchen areas are common in healthcare settings, especially in elderly care. These spaces should be inviting and comfortable. It should be easy to socialise, participate in activities and enjoy a visit from friends or family.

Common sound sources in these spaces are people talking, clatter from tableware, dishwashers, fridges and TVs. Since all the people who live in elderly care, and many of those who seek care in hospitals, are more than 60 years old it is crucial to consider that many of the people in the space are likely to have some degree of hearing loss.

Challenge: *To ensure very high speech clarity, by reducing echoes and preventing sound levels from escalating.*

Solution: *Using sound-absorbing ceilings with the best absorption qualities at all frequencies. To improve listening comfort for people with hearing loss it is important to consider good performance at low frequencies (125 Hz). Wall absorbers on two adjacent walls stop echoes from bouncing back and forth, improving speech clarity further.echoes from bouncing back and forth, improving speech clarity further.*

Acoustic considerations:

Speech clarity and sound levels
(see page 30 for more information on acoustics)

Top:

Verpleeghuis Willibrord, Netherlands
Photographer: Petra Appelhof

Right:

Verpleeghuis Willibrord, Netherlands
Photographer: Petra Appelhof

A new home

away from home

A personal living space in elderly care should feel safe, private and comfortable. To ensure this, it is important to reduce the impact of noise. Echoes need to be eliminated to ensure that conversations with visitors and staff can be conducted in a regular tone of voice. The absence of echoes also enables the use of equipment such as TVs, radios and computers without having to turn the volume up.

As with any type of space in elderly care, it is important to consider that people may be experiencing different types of hearing loss. Noise and hearing difficulties are known to cause anxiety, stress and withdrawal from social activities.

Challenge: *To reduce reverberating echoes, to ensure privacy, to minimise the impact of sound created within the space and to keep sound from adjoining rooms and corridors out of the living space.*

Solution: *A sound-absorbing ceiling in the space and sound insulation between rooms and to the corridor.*

Acoustic considerations:

Reverberation and privacy
(see page 30 for more information on acoustics)

Top:
Karolinska University Hospital, Sweden
Photographer: Philips

Right:
Karolinska University Hospital, Sweden
Photographer: Philips

Concentrating

among others

In administrative areas such as open-plan offices, cellular offices, meeting rooms and nurses' rooms, staff need to be able to perform a number of different tasks during the day. They will have frequent phone conversations, need to concentrate on important tasks and work on the computer. But they will also walk around, have meetings and discuss daily business across desks. Medical secretaries often share the same space, where they first need to receive information clearly and then enter it correctly into the medical records system.

If left unresolved the acoustic situation in administrative areas can become chaotic, with sound spreading everywhere, leading to escalating sound levels along with disturbed and distracted co-workers throughout the space.

Challenge: *To support the activity being performed in the various administrative areas and to enable concentration.*

In open-plan spaces it is vital to keep speech and other sound from spreading.

In smaller spaces it is important to think about privacy, enhancing communication and avoiding echoes.

Solution: *Open-plan spaces: a sound-absorbing ceiling with good absorption qualities at speech frequencies, wall absorbers, sound-absorbing screens to divide the area into smaller ones, and low, free-hanging units over desks.*

In small spaces: good sound insulation, a sound-absorbing ceiling and wall absorbers on two adjacent walls.

Acoustic considerations:

Sound level, sound propagation, speech clarity and privacy
(see page 30 for more information on acoustics)

Top:
Ulster Hospital, Innovation and Medical Centre, Ireland
Photographer: Gordon McAvoy
Right:
Meander Medisch Centrum, Netherlands
Photographer: Lighthouse Productions Dirk Verwoerd

Hearing is the basis

for understanding

Educational spaces, such as lecture halls and meeting rooms, are vital for the transfer of knowledge. To ensure that the audience understand the message, they have to be able to listen and think at the same time. If they have to use all their concentration to hear what the speaker is saying, they will remember a lot less of what they heard.

In an educational space the lecturer's voice needs to comfortably reach the whole audience without distortion. Background noise from ventilation, projectors and other technical equipment needs to be kept to a minimum.

Challenge: *Improving speech clarity, listening comfort and speaker comfort.*

Solution: *A sound-absorbing ceiling with the best absorption qualities at all frequencies. To further improve listening comfort it is important to consider good performance at low frequencies (125 Hz).*

Wall absorbers on the back wall opposite the speaker improve speech clarity by reducing echoes.

In larger lecture halls where the listeners sit more than eight metres from the speaker, a speech-reflecting zone should be added to the ceiling. This ensures the lecturer's voice will carry all the way to the back of the room.

Acoustic considerations:

Speech clarity and reverberation
(see page 30 for more information on acoustics)

On the road to

acoustic comfort

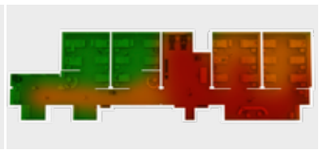
When you have defined your space according to activity, people and the space itself, the next step is finding the acoustic solution to achieve the desired acoustic comfort. Depending on what will happen in your space, your solution should have different acoustic qualities. When you have identified these qualities it is much easier for you to find the acoustic systems you need.

Sound propagation

Sound spreading through a space. Without preventing sound propagation, sound will spread throughout the space leading to increased sound levels and constant disturbance. To prevent this you need a ceiling with at least absorption class A. In most cases you also have to supplement the ceiling with sound-absorbing screens and wall absorbers.

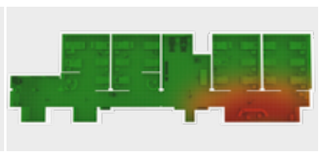
Since speech is one of the most common sounds indoors, it is very important that the sound absorbers perform well at the dominant speech frequencies. To ensure this, your class A ceiling should have a high Articulation Class value.

Sound propagation without sound-absorbing elements.



Sound propagation with Absorption Class A ceiling installed in the corridor.

Sound propagation with Absorption Class A ceiling in the ward rooms and Absorption Class A ceiling and Akusto Wall in the corridor.



Distance of comfort

The distance speech travels before it is perceived to be halved (58 dB to 48 dB). The shorter the distance – the better. A combination of acoustic ceilings with high Articulation Class values, acoustic wall panels and acoustic screens helps you improve the distance of comfort. In the illustrations above, the green sound waves appear at the distance where the sound has been reduced to 48 dB.

General sound strength

The combination of all sounds present in a space. A high sound level leads to people having to raise their voices to be heard above all the surrounding noise – the so-called Café Effect. To absorb as much sound as possible, you need to make sure that all sound absorbers are of the highest quality.

Reverberation

Sound that bounces back to you. In smaller spaces and larger spaces with a lot of hard surfaces, it is easy for sound and speech to bounce off walls and surfaces and create echoes. These echoes will make it hard to hear what you want to hear. To prevent reverberation you need the right amount of absorption in the ceiling and on the walls, in relation to the size of the space.

Speech clarity

Being able to be heard and understood without having to raise your voice. Late reflections (echoes) and background noise from installations, such as office equipment and video projectors/beamers, reduce speech clarity and hinder communication. A combination of acoustic ceilings and acoustic wall absorbers help you create a space where speech clarity is high.

All these acoustic parameters are based on ISO 3382-1, ISO 3382-2 and ISO 3382-3.

Measurements of acoustic qualities

Wall-to-wall ceilings
When using a wall-to-wall ceiling, the practical absorption at different frequencies is measured. The measurement is then, for the ease of communication, turned into a classification of absorption class: A, B, C etc. Absorption class A has the highest absorption.

Sound absorbers smaller than 10 m²
If free-hanging units or screens with a sound absorption area of less than 10 m² are used, it is not recommended to measure the absorption in the same way as a full coverage ceiling. Instead, the cluster's equivalent absorption area (A_{eq}) in square metres is measured.

For instance, if a cluster of sound absorbers that covers 5 m² renders a measured Aeq of 7.5 m² at a certain frequency, this means that every installed square metre has an equivalent absorption area of 1.5 m² (7.5/5) at that frequency.

These measurements and classifications are done according to ISO 354 and ISO 11654.

The sustainable choice

Green, durable and recyclable

You hold us responsible. We owe you full transparency regarding our products' environmental impact and the efforts we are making to reduce this impact. This is why we do in-depth life cycle analyses to uncover every aspect of our products' life cycle. Armed with that knowledge, we push ourselves to improve every phase, from sourcing raw materials and production to transportation and handling of waste.

Follow our journey on ecophon.com/sustainability

Over the past several years, our efforts to improve the impact of our products at every stage has helped us to reduce emissions, find new eco-friendly material, create healthier indoor environments and implement recycling of used panels. These efforts have earned our whole product range some of the toughest certifications and classifications in the world. These include the Nordic Ecolabel, the Californian Emission Regulation standard and the French VOC A+.

A+

All Ecophon absorbers are made with our revolutionary 3rd generation glass wool, which combines more than 70% recycled glass with a renewable plant-based binder. The complete lack of fossil raw material saves the equivalent of 24,000 barrels of crude oil annually.

We are very proud that we most probably have the lowest CO_2 emissions in the business, per produced square metre. The main reasons for this are:

- The use of our renewable plant-based binder in all absorbers
- 70% of our glass raw material is already recycled
- Our factories are largely powered by hydroelectric power and biogas
- Our absorbers are very lightweight, reducing the emissions from transportation

CO_2 emissions for specific products can be found on ecophon.com and in the product EPD.

Choosing the most sustainable products for a building is often very hard. To help you succeed we have reported all the information about our products' life cycle in EPDs (Environmental Product Declarations). And to make sure we give you the whole truth, all our EPDs are third-party verified by independent organisations. Ecophon EPDs are available on ecophon.com.

EPD VERIFIED

Guaranteed

We don't ride off into the sunset when installation is complete. We take responsibility for the whole life cycle of our products. This is the reason we have developed a recycling programme for all our products made with 3rd generation glass wool. Starting on 1 January 2016, we open our gates for the return of your old panels.

We are not done. There is always a new leaf waiting to unfold. That's why Ecophon will never stop inventing new and even more sustainable solutions – for the planet, and for those of us who live here.

Watch the film showing our evolution so far on ecophon.com/evolution.

Naturally safe

Ecophon never use unnecessary chemicals in our products; we simply don't believe in it. Instead we develop products and surfaces that are naturally completely safe and do not provide breeding grounds for bacteria. Many experts in public health agree with our course of action, including the UK Department of Health, which concluded, regarding the use of anti-microbial chemicals:

"Whilst antimicrobial-impregnated products (such as surface coatings, paints and curtains) and antimicrobial materials are available, there are, at present, no definitive data to support their efficacy in reducing healthcare-associated infection." (Health Building Note 00-10)

Our products meet the highest requirements of NF S90-351, zone 4 and American Society for Testing and Materials (ASTM) G21-96, grade 0.

Ecophon has two ceiling systems that are ideal for TABS buildings (Thermally Activated Building Systems): Ecophon Master™ Matrix and Ecophon Solo™. Based on extensive studies and tests, Ecophon recommends 60 per cent coverage in TABS buildings. This will maintain thermal performance and at the same time provide a good acoustic environment. And if you combine the ceiling coverage with Ecophon Akusto™ Wall and Ecophon Akusto™ Screen you can achieve an atmosphere that is very pleasing to both the ear and the eye.

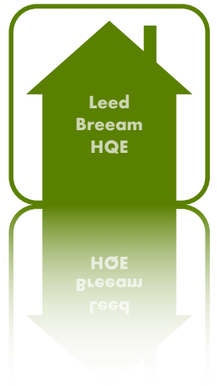
60%

Durable

Soft and white doesn't mean fragile. Our absorbers are extremely sustainable and will last and perform for many years to come. They don't really need any maintenance except the occasional cleaning. They are easy to install and if you need access to the ceiling void you can easily remove panels and then put them back again. If you need a ceiling solution to be impact resistant or secured, we have solutions for this as well. And they are still removable.

Akutex™ Surface Technology by Ecophon®

Retroreflection is a way to describe how light will spread more evenly in a room, giving it a very pleasant atmosphere. Retroreflection capacity is one of the properties that make Akutex™ FT a unique surface. To give you an example, if you paint a wall red, the Akutex FT surface will not reflect the red colour and spread it throughout the room. The colour will, so to speak, stay on the wall. Or, as one architect described it, "It's almost as if the Akutex FT surface has integrity; it doesn't let the surroundings affect it".



Even green building organisations choose Ecophon. When Green Building Council South Africa built their new offices they designed them with our acoustic solutions. We think they made a good choice, because if you are going green, why not use the most sustainable sound absorbers on the market?

Acoustics is a part of all leading certification schemes, such as Leed, Breeam and HQE.

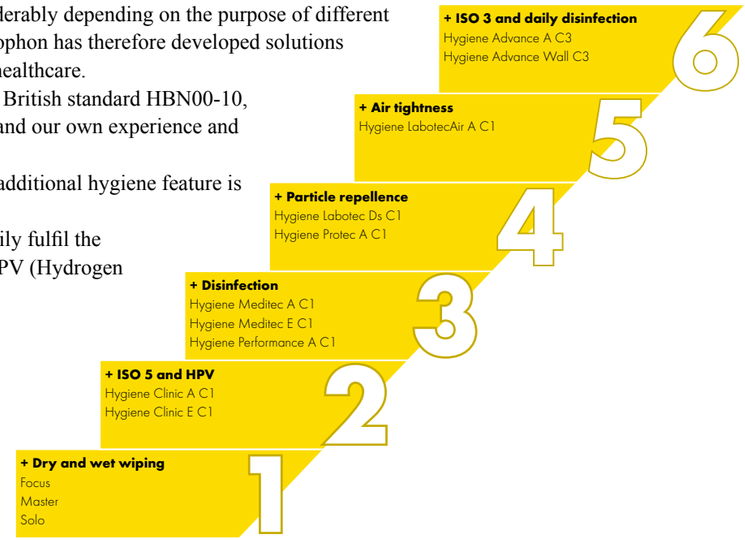
Hygienic and air tight

Hygiene demands can vary considerably depending on the purpose of different spaces in a healthcare facility. Ecophon has therefore developed solutions that fit every hygiene demand in healthcare.

The categories are based on the British standard HBN00-10, the French standard NF S90-351 and our own experience and knowledge.

For every step up the stairs, an additional hygiene feature is added to the system performance.

All systems in the Hygiene family fulfil the requirements for ISO 5 and are HPV (Hydrogen Peroxide Vapour) resistant.



Ecophon Focus™

Entering a universe of design and flexibility

Focus is our most comprehensive system family and offers excellent acoustics with a wide range of design opportunities through different edge designs, forms, levels and installation options. This makes Focus systems a valuable partner to achieve the atmosphere you strive for in your design. Focus is also easily and seamlessly integrated with Ecophon Lighting.

- Endless options
- Possibility of level changes
- Design and precision

Ecophon Master™

Taking care of demanding conditions

The Master family is unrivalled when it comes to sound absorption and speech clarity. It is simply the best. So when you have a tough sound environment, such as a space where phones are used frequently, we highly recommend you turn to Master to find your solution.

- Performance
- Superior acoustics
- Robust

Ecophon Solo™

Experiencing freedom of expression

The ever-trendy Solo comes in several shapes and sizes. If you desire, you can also create your very own shape. With Solo you have total freedom of design and the opportunity to create your own striking new expressions while keeping up to date with sustainable architectural developments.

- Unique perspective
- Any shape
- Creative possibilities

Ecophon Hygiene™

Ensuring the required level of purity and cleanliness

A proven performer in several hygienically and clinically demanding environments; Hygiene and our complete systems are designed to fulfil even the toughest requirements.

- Safe and proven
- Adaptable solutions
- Cleanability and disinfection

Ecophon Akusto™

Exploring the variety of the vertical

As a complement to acoustic ceilings, Akusto enhances the acoustic solution and allows you to create the best possible acoustic comfort. At the same time it provides opportunities to follow current trends in design, with an array of colours, textured finishes and stylish profiles.

- Diversity
- Acoustically engineered
- Vertical acoustics

Soundlight Comfort

Where sound meets light, comfort is built

The Soundlight Comfort systems improve wellbeing and performance in the office space by integrating comfortable LED lighting with superior sound absorption in integrated lighting and acoustic ceiling systems. When light and sound behave in a more natural way, we experience a unique level of comfort – a synergy we call Soundlight Comfort.

- Superior acoustics
- Integration
- LED Technology

For the eye, the ear and the mind

Ecophon®
SAINT-GOBAIN

A SOUND EFFECT ON PEOPLE

Ecophon dates back to 1958, when the first sound absorbers from glass wool were produced in Sweden to improve the acoustic working environment. Today the company is a global supplier of acoustic systems that contribute to good room acoustics and a healthy indoor environment with the focus on offices, education, health care and industrial manufacturing premises. Ecophon is part of the Saint-Gobain Group and has sales units and distributors in many countries.

Ecophon efforts are guided by a vision of earning global leadership in room acoustic comfort through sound-absorbing systems, enhancing end-user performance and wellbeing. Ecophon maintains an ongoing dialogue with government agencies, working environment organisations and research institutes, and is involved in formulating national standards in the field of room acoustics, where Ecophon contributes to a better working environment wherever people work and communicate.

www.ecophon.com

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