ECOPHON EDUCATION GUIDE

MAKING WHAT'S IMPORTANT HEARD

Get sound-smart **by design**

5 TIPS
FOR A BETTER
SOUND ENVIRONMENT
IN SCHOOLS

LOW FREQUENCIES

Free the
full potential
of education

Ecophon
SAINT-GOBAIN

Contents

04 MAKING WHAT'S IMPORTANT HEARD

06 FREE THE FULL POTENTIAL OF EDUCATION

10 5 WAYS TO BETTER SOUND IN SCHOOLS

11 SOUND LEVELS IN DECIBELS

12 LEARNING FROM NATURE

15 ACOUSTIC CEILINGS AND WALLS

16 A FAIRER START

18 SMART SOUND DESIGN

20 ROOMS TO GROW IN

22 GETTING THE LOWS RIGHT

24 WHEN CONDITIONS ARE TOUGH

25 ECOPHON PRODUCTS FOR EDUCATION

26 HIUKKAVAARA SCHOOL AND COMMUNITY CENTRE

28 IMPROVING NOW FOR A BETTER TOMORROW

30 GET TO KNOW US

31 REFERENCES

Making what's important

HEARD

Ecophon believes in education – its importance, relevance and power to literally transform the world for the better. We believe equally strongly that preventing disruptive, unnecessary noise in learning environments is fundamental to that idea.

Our educational environments are where we learn to discover what is best about ourselves. They are where life paths are chosen, values and personalities are formed, ideas and ambition are nurtured and friendships are forged. In these spaces, how and what we hear will have lasting effects on our lives, and by extension, the world around us.

No ambition should be compromised by a misunderstood sentence. No potential need be held back by background noise. In education, what's important to any of us should be important to all of us. Make sure it's heard with Ecophon.

Free the full potential

Sound
is wanted.

Noise
is unwanted.

OF EDUCATION

Imagine we could increase student test scores. Or improve their collaboration skills and confidence to speak up. Or speed up their ability to perform complex tasks. All these improvements have been proven possible, simply by optimizing the acoustics in the learning environment.

Less chaotic sound spaces make it easier to understand speech. They improve understanding, concentration and ability to focus, speed up problem-solving and minimize stress. All of which can lead to a rewarding learning environment with more motivated teachers and students. But the potential downstream benefits, in terms of student's ability to realize their ambitions, could be enormous. To them, and to us all.

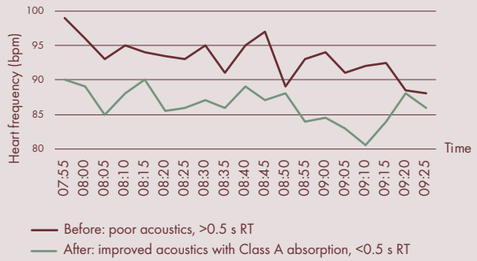
REDUCING REVERBERATION TIME

in a room leads to significantly less perceived noise in students and less annoyance caused by noise. Children also perceives their teachers significantly more favourably when reverberation time is lower.[1]

64 DB BACKGROUND NOISE, AN AVERAGE THAT IS COMMON TO MOST CLASSROOMS[2]

WITH A CLASS A ACOUSTIC TREATMENT, TEACHER HEART-RATES CAN CALM DOWN UP TO 10 BEATS PER MINUTE.[3]

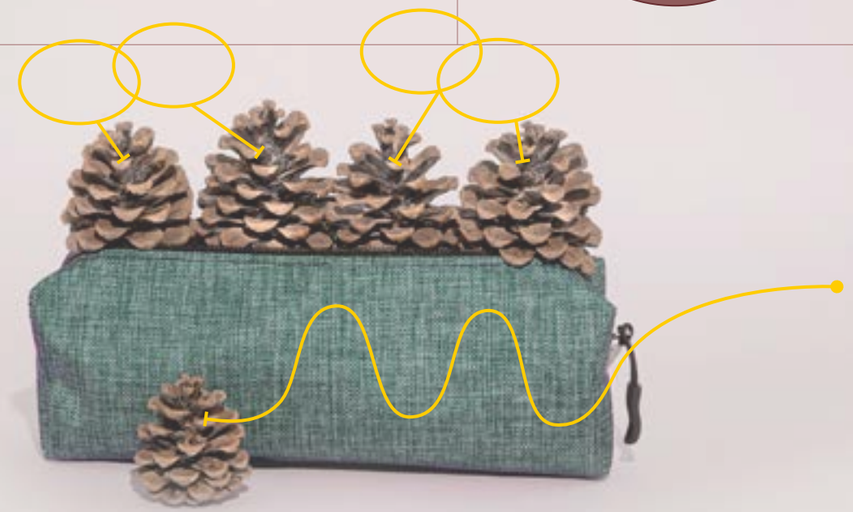
Teachers' pulse in good and poor sound environments



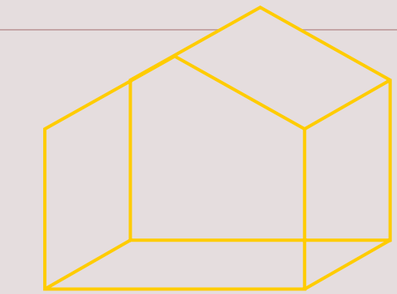
THE IMPACT OF BETTER ACOUSTICS

is particularly strong when the students are engaging in group work. In traditional, lecture-based lessons, acoustic refurbishment reduced noise levels by up to 6 dB. But the benefit was even greater when children were working in groups, where the reduction in background noise levels increased to 13 dB.[3]

Good acoustics can improve speech intelligibility by more than **35%**[4]



BETTER ACOUSTICS **REDUCE** INCIDENCES OF **DISRUPTIVE OCCURRENCES** IN THE CLASSROOM[3]



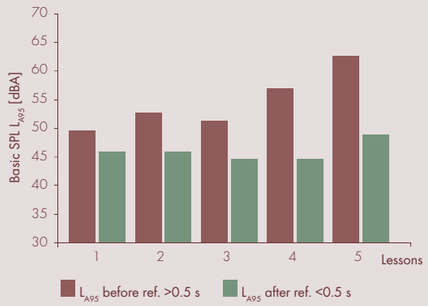
BUILDING A CLASSROOM ENVIRONMENT

according to the best acoustic recommendations makes it possible for teachers to speak more quietly and still be heard above the background noise. It also makes children speak more quietly in the classroom (i.e. reverse Lombard effect).[5]

THE LOMBARD EFFECT

when acoustics are bad, noise levels rise even higher as people try to shout louder than each other. This causes an even higher background noise level, and the same thing happens again – they try to out-compete each other again. And so on and on.[6]

Increase of activity sound levels (L_{A95}) before and after refurbishment[3]



5 WAYS TO BETTER SOUND IN SCHOOLS

#1 MAKE STUDENTS THE SCIENTISTS

In physics, teach children what sound and noise is. In biology, how noise impacts health. And in social studies, the importance of limiting noise to promote inclusive learning. In other words, help them come to their own understanding of the importance of noise reduction.

#2 ENCOURAGE RESPECTFUL INTERACTION

Much noise in the classroom comes from the students themselves, in turn leading to ever higher volumes and disruptive behaviour. Use proven strategies such as the PAX Good Behaviour Game and PAX Voice Game* to make the classroom a peaceful and productive learning environment.

#3 MEASURE, MEASURE, MEASURE!

Every school should have routines for identifying improvements in the sound environment. Acoustic measurements should be carried out regularly to make sure all classrooms follow national guidelines.

#4 PRIORITIZE QUALITY

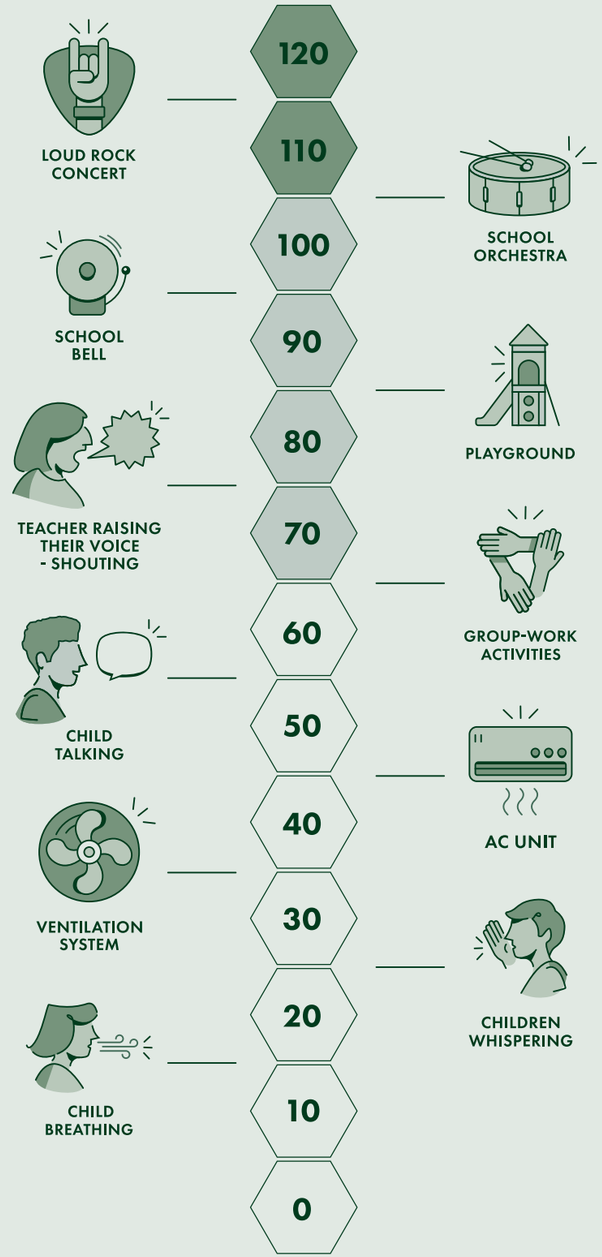
A common denominator for classrooms with a good sound environment is high quality acoustic ceilings and wall absorbers. High quality means choosing “class A” acoustic products.

#5 BUILD BACK EQUAL

Classrooms that meet WHO noise recommendations for students with special needs are good classrooms for all children. Design classrooms for equal opportunity learning by using the Universal Design for Learning (UDL) as a guideline.

* https://www.paxis.org/about-paxis/

SOUND LEVELS IN DECIBELS



Learning from

NATURE

Our hearing system has evolved over thousands of years in outdoor environments where there are no sound reflections from ceilings and walls. But most listening these days is done indoors – and in learning spaces, sound reflections and background noise build up, making hearing, speaking and understanding harder.

All Ecophon solutions start from the understanding that we do better in sound environments that mimic the outdoors. For educational settings, our goal is to replicate outdoor acoustic characteristics indoors so that ambient noise is controlled sufficiently for optimal speech clarity. This lowers sound levels, and increases speech intelligibility and speaker comfort. The resulting calmer, quieter and more relaxing atmosphere improves student and teacher concentration, motivation and well-being – just as nature intended.

ACOUSTIC CEILINGS

An acoustic ceiling is the most effective way to reduce noise levels and to create a sound environment that will improve both well-being and work performance.

Ecophon Master™ is ideal for education premises. Master come in wide range of edge designs and with our Akutex™ FT surface that has a premium look and feel. Easily combined and surface matched with other solutions such as Focus, Combison and Solo.

ACOUSTIC WALLS

Accompanied with an acoustic ceiling, Ecophon Akusto™ sound absorbers for walls give an optimized sound environment for the needs in education. It is important to take care of also the bass sounds in educational premises, hence Ecophon has developed a solution for that also for walls with the unique Akusto™ Wall C Extra Bass.

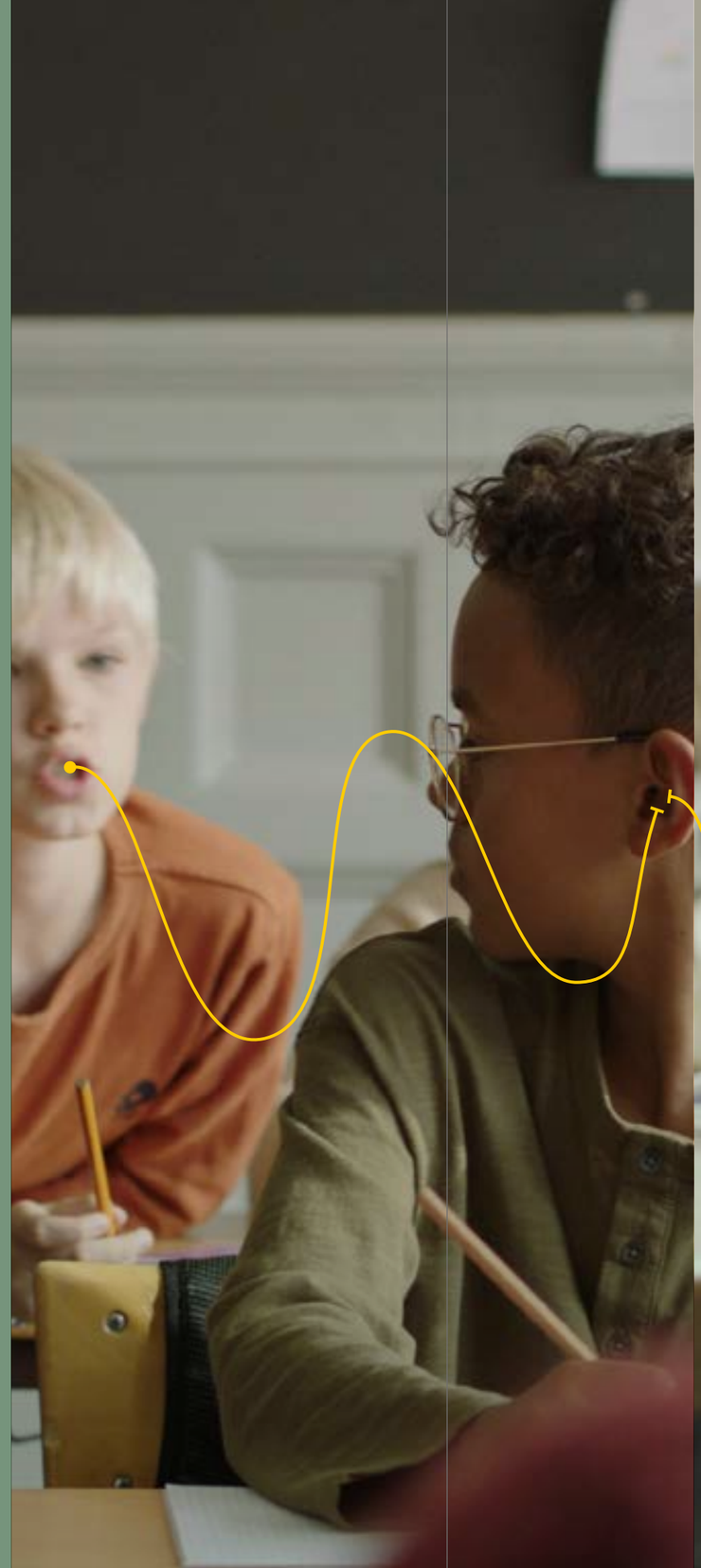
A fairer START

Everyone deserves the opportunity to learn. But some are more vulnerable than others to distractive noise that interferes with their ability to hear, understand and participate. Their potential to be their best can be compromised, especially if they are learners with special hearing, communication and learning needs to start with.

Ecophon solutions can help make it easier to hear instruction above background noise, and optimize the learning space's acoustics to minimize stress and misunderstanding, improve motivation and general learning, and support a stronger rapport with teachers. Inclusivity is rightly a core tenet of modern education. With Ecophon, noise doesn't ever need to be a barrier to equal-opportunity learning and development.

- Noise affects vulnerable students the most
- Test scores from learners with additional needs plummet when environments become noisy
- In every classroom, there is likely to be a number of learners with special education needs (SEN)
- Noise and reverberation recommendations for SEN students also apply to all students – designing for the most vulnerable benefits everyone

---



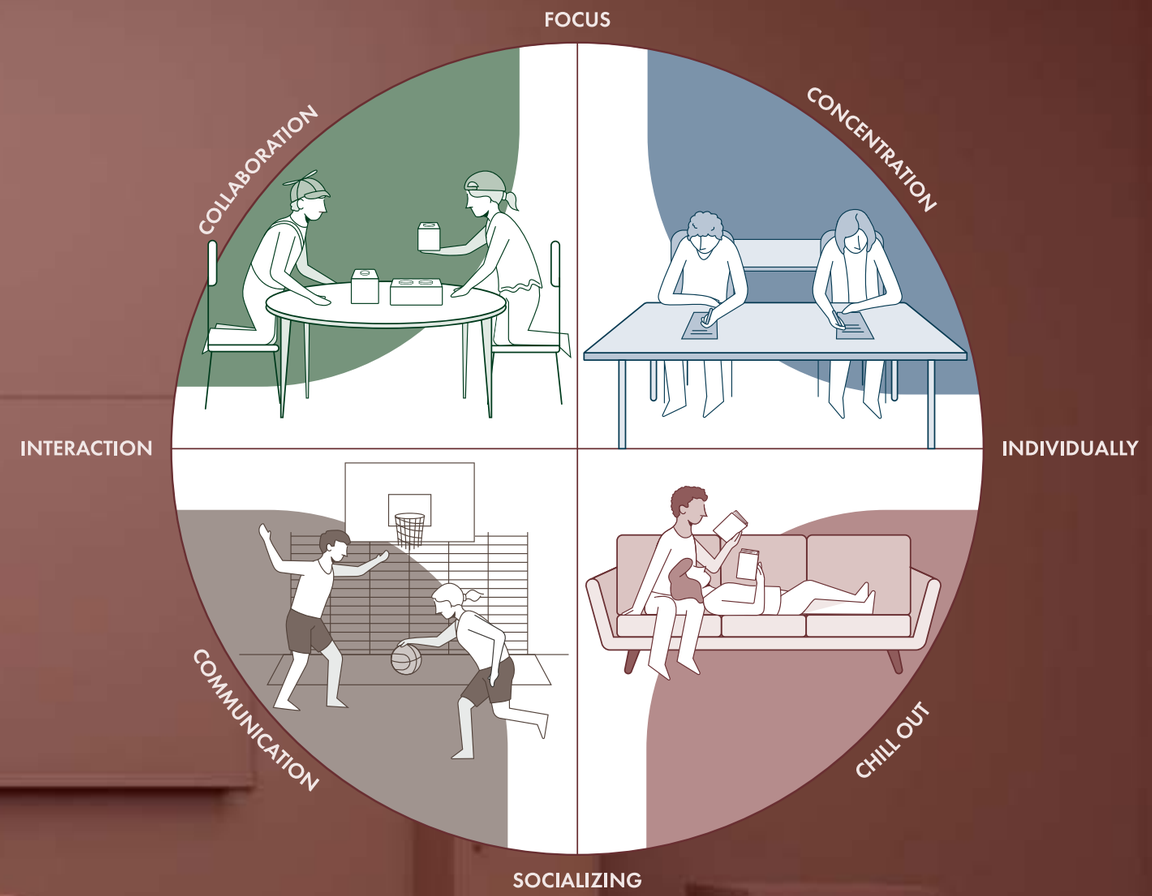
A good **sound environment** is fundamental to developing critical 21st century skills

Smart sound

DESIGN

Average noise levels in the majority of classrooms are louder than outdoor playgrounds. Much of that noise is generated by lingering reverberation of student- and teacher-generated sound, where delayed and new noise, especially at disturbing low frequencies, overlap and grow. Research shows this has negative effects on health, wellbeing and effective learning.

Ecophon offers solutions that are unique in their abiliy to absorb low frequency sound effectively, reducing sound reverberations. Our proprietary Activity Based Acoustic Design model helps you determine the right configuration for optimum acoustics of any educational space, based on its physical characteristics and how it will be used. For every upgrade in noise reduction comes a tendency for students and teachers to interact more quietly and with less effort. This snowball effect further quietens the room – promoting more productive class discussion, group work and teaching that's comfortable to share and grow with.



SPACES TO GROW IN

The importance of optimizing acoustics for every learning space is unquestionable. But no two are exactly alike, and require different approaches depending on the space itself, how it will be used and the needs of the people using it.

Learn more about specific considerations for every space type on this page. Acoustic solutions for each area are featured on page 25.

TYPICAL CLASSROOM

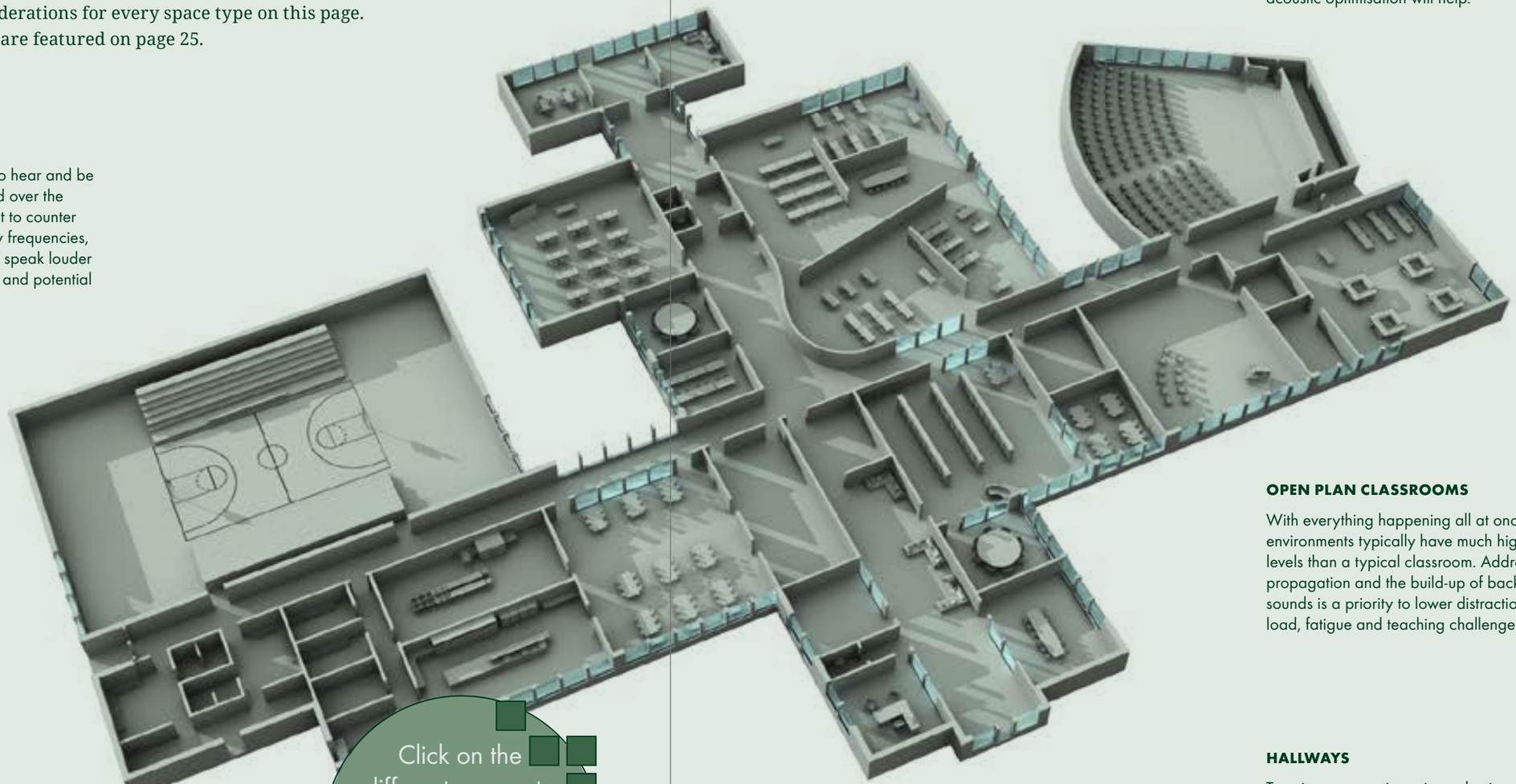
Children and teachers need to be able to hear and be heard, and feel comfortable and focused over the course of a day. It is especially important to counter background noise, particularly in the low frequencies, that can build up and create the need to speak louder to overcome, leading to increased stress and potential for misunderstanding.

SPORTS HALL

Sports hall acoustics need to be good for group collaboration and teamwork, otherwise they can't hear instructions or warnings, or communicate with each other. Sound levels need to be as low as possible to prevent echoes, enabling people to speak in a normal tone and still make themselves heard.

MUSIC CLASSROOM

A music room experiences a variety of instrument sounds and noise levels simultaneously. But it may also be used for musical theory-sharing and teaching. In general, music rooms need high quality ceiling and wall absorbers.



Click on the different spaces to learn more about specific acoustic challenges and solutions

CAFETERIA

Any area where crowds of students gather to eat at the same time is going to get loud, potentially to levels dangerous to hearing. Compensating for the Lombard Effect – increasing vocal response to overcome noise, creating ever-increasing volumes – is a priority.

PLAYSCHOOL

Younger children are more susceptible to distraction and misunderstanding, especially as their hearing is still developing. Playschools are also typically frenetic environments with lots of noise, and a greater need to communicate despite it. An approach similar to typical classroom acoustic optimisation will help.

OPEN PLAN CLASSROOMS

With everything happening all at once, these environments typically have much higher noise levels than a typical classroom. Addressing sound propagation and the build-up of background sounds is a priority to lower distraction, cognitive load, fatigue and teaching challenges.

HALLWAYS

Transit areas require noise reduction strategies because they are all reflective surfaces, with very few barriers to impede sound travel. That means a lot of noise, which if not dealt with travels through ventilation ducts and into surrounding classrooms, potentially disturbing lessons.

GETTING THE LOWS RIGHT

Of all the sound challenges addressed in acoustic optimisation for education, low frequencies may be the most important. In learning environments, many everyday sounds have a troublesome low-frequency component – think ventilation systems, voices, scraping chairs, footsteps, and traffic noise – and they travel easily, including through walls.

The problem is low frequency sounds take longer to decay. They block our ability to hear higher frequencies – which a large percentage of spoken language consists of in the form of consonants. The result is poorer speech perception, which is problematic for younger children, whose hearing is still developing, and learners with special hearing and communication needs (SHCN), who are likely part of most classrooms.

SPECIAL LISTENING NEEDS ARE DEFINED AS:

- Hearing impairment – permanent and fluctuating
- Auditory processing disorder
- Speech, language and communication difficulties
- Attention deficit hyperactivity disorders
- Autism spectrum

SCHN or not, all children are vulnerable to hearing and understanding problems due to low frequency sound proliferation – designing for the most vulnerable benefits everyone.

ECOPHON SOLUTIONS

Ecophon Master™ Rigid is specially developed for classrooms, where good acoustics and speech intelligibility are vitally important. Just as the other Master products it can be combined with our unique low frequency absorber Ecophon Extra Bass.

Akusto™ Wall C Extra Bass is a uniqe wall absorber that effectively absorb sound also in the low frequencies. It helps increase speech understanding, lower noise over a very broad frequency range and ultimately, makes hearing more inclusive where it's needed most – in our educational settings.

The strong Super G woven fabric surface combined with premium edges results in a robust and impact resistant panel of superior quality.

WHEN CONDITIONS ARE TOUGH

High demands regarding impact resistance do not have to mean a poor sound environment. Ecophon Super G™ delivers powerful sound absorption in tough conditions. Choose Super G for school corridors, sports halls and other environments where there's a risk of mechanical impact. The robust systems have a low system weight which makes them easy to handle and install.

All Ecophon Super G products are tested and graded between 1A-3A.

1A High velocity sport halls such as hand ball or tennis courts.

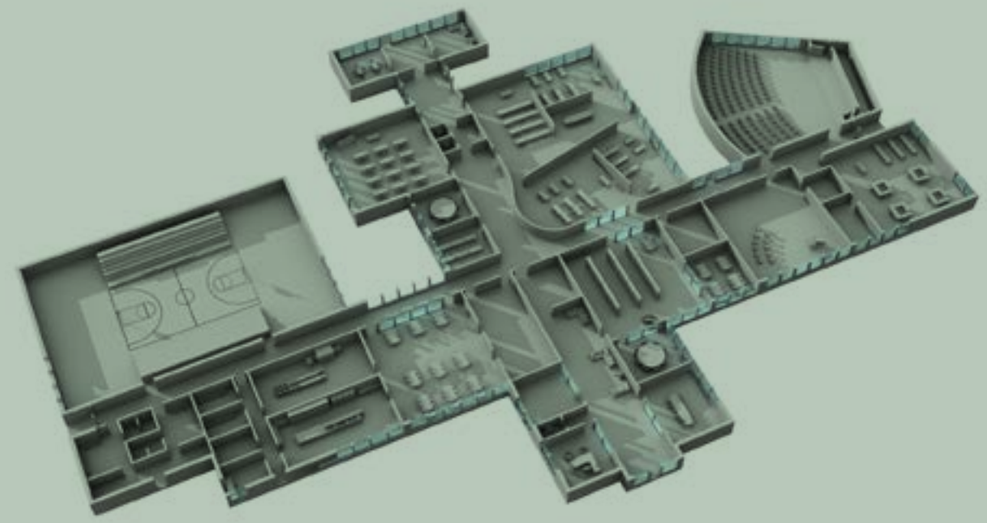
2A Where low energy ball games take place such as volleyball or soft ball.

3A Where low levels of impact resistance is needed such as corridors in schools or day care centres.

Ecophon Super G™ Plus A is developed for environments where maximum impact resistance is needed and is 1A classified for high mechanical impact.

SELECT THE BEST ECOPHON SOLUTIONS FOR YOUR NEEDS

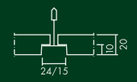
SPACE	MASTER RIGID	AKUSTO WALL	GEDINA	SUPER G	FOCUS	MASTER	SOLO	AKUSTO ONE	HYGIENE PROTEC	HYGIENE PERFOR-MANCE	HYGIENE ADVANCE
CLASSROOM	•	•	•								
HALLWAYS	•	•		•	•						
SPORTS HALL		•		•							
CAFETERIA		•		•		•					
PLAYSCHOOL		•	•			•					
OPEN PLAN CLASSROOM		•	•			•					
MUSIC CLASSROOM		•				•					
ENTRANCE		•				•	•	•			
STAFF ROOM		•			•			•			
WORKSHOP		•		•							
LABORATORY									•		
CHANGING AND SHOWER ROOMS				•						•	•
KITCHEN										•	•



FOCUS E
Recessed visible grid system creating a shadow effect on the edge. Easily demountable tiles.

AKUSTO WALL C
Seamless framed wall panel solutions in wide range of colours.

SOLO BAFFLE
Design possibilities with colours and different sizes in a vertical installation.



HIUKKAVAARA SCHOOL AND COMMUNITY CENTRE

Hiukkavaara Community Centre's defining feature is its versatility. The school building, designed for 700, houses not only a primary and lower secondary school with 350 students, but also a day-care centre and preschool, a youth centre, and a library. Local residents can make use not only of the spaces, but also of community and adult education activities and sports facilities.

Work on the centre was completed in the summer of 2017, and was guided by objectives relating to sustainability, environmental impact and energy efficiency. This led to the building being granted a gold rating under the international green property certification system LEED for Schools.

LISTENING BEGINS AT THE PLANNING STAGE

In open learning environments specifically, acoustics require particular attention. An acoustic designer was closely involved from the start to address management of unnecessary distractions, prevention of teacher voice problems and more through acoustic optimisation. Users' needs were also taken into account: teachers, pupils, and day-care centre staff were all consulted. Everyone using and managing the spaces is happy with the results.

Improving now

FOR A BETTER TOMORROW

Empowering our future begins with protecting it. That's why sustainability has to be one of the core principles of quality education – if taught, shared and applied collectively, it will benefit us all. Good acoustics have a natural place in that effort, and setting the right example in educational settings is a good investment that pays dividends today, while contributing to a more healthful tomorrow.

The Ecophon approach starts with a fundamental respect for people. That means use of nature-and people-friendly materials, and adapting our production processes and logistics to minimize our environmental footprint as much as possible. In fact, every step from research and development to installation of our solutions is considered from its sustainability impact. We firmly believe in the power of sustainable acoustic treatments to optimize our learning settings. But not at any cost – in education more than anywhere, making what's important heard has to start in doing what's important, right.

GET TO KNOW US

Let’s Connect. 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.

Use our digital tools, for the different phases of the building process, from the inspiration phase to specific maintenance instructions for your Ecophon products.

www.ecophon.com

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.

www.facebook.com/Ecophon

www.linkedin.com/company/ecophon

www.twitter.com/Ecophon

www.youtube.com/c/EcophonTV

www.pinterest.se/saintgobainecophon

Please also take a look at our blog Acoustic Bulletin, which a global platform where posts and channels are a valuable tool for end users, architects and acoustcians to quickly access knowledge, opinions and solutions for room acoustic design.

www.acousticbulletin.com

REFERENCES

1. Effects of classroom acoustics on performance and well-being in elementary school children: A field study. Klatte, M., Hellbruck, J., Seidel, J. and Leistner, P. Environment and Behavior, 42(5). 2010.
2. The impact of classroom noise on reading comprehension of secondary school pupils. Shield, B., Connolly, D., Dockrell, J., Cox, T., Mydlarz,C. and Conetta, R. Proceedings of the Institute of Acoustics, Vol. 40. 2018.
3. Tiesler, G. & Oberdoster, M. Acoustic ergonomics of school. 2006.
4. Classroom Acoustics: A Research Project; Summary Report. McKenzie, D.J. and Airey, S. Heriot-Watt University, Department of Building Engineering and Surveying. 1999.
5. The Essex study – Optimising classroom acoustics for all. Canning & James. 2012.
6. The evolution of the Lombard effect: 100 years of psychoacoustic research. Brumm, H., & Zollinger, S. A. Behaviour, 148(11-13). 2011.

Ecophon is the leading supplier of indoor acoustic solutions that improve working performance and quality of life. We believe in the difference sound can make to our everyday lives, and are passionate advocates for the importance of room acoustics to people's wellbeing – whatever the space, activity or need.

Having a sound effect on people is the principle that guides all we do. We're proud of the Swedish heritage and human approach that promise is founded on. Our uncompromising commitment to transparent sustainable practice. And, as members of the Saint-Gobain Group, to be doing our part in making the world a better home.

SAINT-GOBAIN

Ecophon
SAINT-GOBAIN