

# 5 TIPS FOR IMPROVING ROOM ACOUSTICS

A BEGINNERS GUIDE TO GOOD AND SUSTAINABLE ACOUSTICS

**"A desire for well-being must be the foundation of all architecture."**

*Jørn Utzon 1948*

**A room's acoustics affects** us all, whether we want it or not. Bad acoustics reduce speech clarity, affects concentration, and it can even affect peoples physical and mental wellbeing in a myriad of ways. This has shown to have, for example, headache, stress, or tenseness as a result. Therefore it is always important to have acoustics in mind when one is in the process of renovating a room or a building – both privately and commercially.

We have collected 5 simple tips for you to enjoy. These tips will be a valuable tool in creating a sustainable, acoustic environment.

### 1. Reverberation time is key – but remember to listen

There are many ways in which one can judge whether the acoustics of a room is defective. The best indicator will always be the human ear but there are multiple other technical indicators that can guide you.

If it is hard to have relaxed conversations and exhausting to listen to other peoples speak then it probably is due to long reverberation time. Reverberation time is the time it takes from a sound is created until it is reduced by 60 dB. This often means the time it takes for a sound to be reduced to a level that is either comfortable or inaudible to the human ear. There is a range of factors that affects the reverberation time but it is often increased if a room has many free, hard surfaces that can reflect the sound waves.

The general rule is that the lower the reverberation time, the better the experience of the room is and the easier you can understand what other people are saying.

For example, classrooms in danish schools cannot have a reverberation time above 0,6 seconds since this would be exhausting for teachers and students alike and affect the concentration and learning of the class. Long reverberation time can also increase the general noise level further – what acousticians call the Lombard effect.

If you wish to make acoustic renovations, it is basically the reverberation time that you want to reduce. A range of 'acoustic apps' exist and they can all give you some indication of the reverberation time of a room.

Reverberation time can be reduced installing acoustic materials or by rearranging interiors. The acoustic materials can slow down or absorb sound waves so only minimal reflection happens. If you reduce the reverberation time markedly, you will instantly be able to feel an increase in concentration and performance levels as well as your general wellbeing.

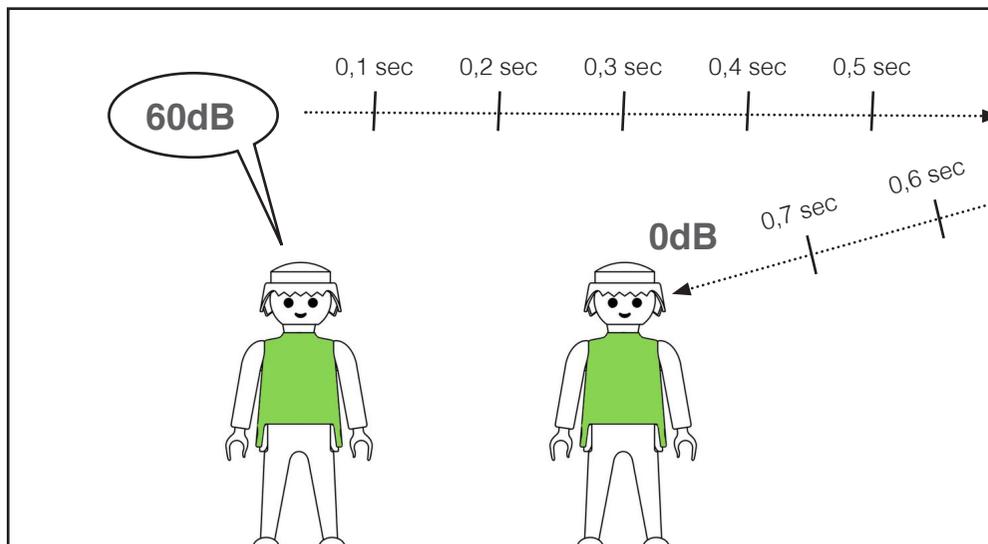
### Faktabox

#### Decibel dB

A unit of measure for sound volume. It is a logarithmic scale that doubles the effect every 3 dB. Leaves blowing in the wind, a mosquito, or a modern computer barely reach 10 dB. Whispering is around 30 dB, and a normal conversation is about 60 dB. A baby that screams can hit, not unlike motorcycles, 80 dB. If one frequents concerts, one will experience volumes up to 110 dB which is roughly the same dB as jackhammers and circular saws. The noise from a jet plane is around 130 dB, i.e. the pain threshold of human hearing.

#### Lombard effect

The Lombard effect (or cocktail or kindergarten effect) is the tendency for people to speak louder and louder in correlation to the amount of noise in a room.



## 2. Consider material placement

When we speak, we produce sound waves that are reflected on surfaces around the room. The material character and hardness of surfaces, therefore, has a great influence on the reverberation time. A rule of thumb is therefore that it is the hard, smooth surfaces that need acoustic materials the most.

It should be noted that this is only a rule of thumb and that material placement, in reality, is more complicated than as such. If one, for example, wants to increase the speech intelligibility of a room (the degree to which we can comprehend speech), it is not always the best idea to cover the ceiling in acoustic materials. In rooms with high ceilings, it will often be better to place acoustic materials on the walls (or perhaps some carpets) since speech is mostly, but not exclusively, reflected in head level.

Sound is a diffuse phenomenon, and some sound waves will always reflect on the ceiling. But if the ceiling is high, a part of the speech will lose its force before it can even reach the ceiling. On the other hand, the ceiling can successfully be dampened if the space is low-ceilinged purely because of the shorter distance between the speaker, ceiling, and the receiver of the speak.

You can dampen ceilings, walls, floors, and beneath interiors. What is most effective depends on the architecture of the room.

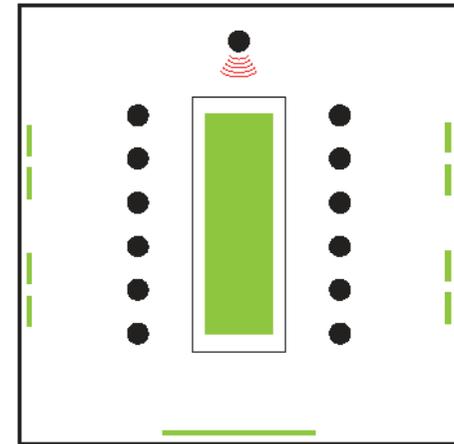
## 3. Consider the function of the room

You should always contemplate what it is that you are trying to achieve with acoustic regulations. Is it a big open office where people has to be able to concentrate? Is it a room for children? Is it a place for creative development? Perhaps a mixture?

There, sadly, is no clear cut answer to how you design acoustics according to a room's function. But if you, for example, have an office that calls for concentration, it may be right to dampen as much as possible. The more material, the better the dampening. Such a solution would be ideal for most 'silent', concentrated work but it can easily feel over-dampened if you want to also have quiet conversations in the room.

You can also imagine a room where there needs to be space for both deep concentration, conversation, and creativity. Here it would not be ideal to fill up the room with acoustic materials. Instead, you could consider zoning the room with acoustic partitioners. Then, concentration can take place in a dampened and isolated zone, where conversations and creative expressions can take place in another zone that is only dampened to a point that improves speech intelligibility.

Another example could be a church: Here you would not want a radical shortening of reverberation time (and it is not possible). Instead, you would want to go to a level where you can clearly understand speech but without destroying the big and majestic auditive experience that churches can give.



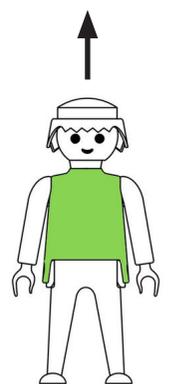
Concentration



Communication



Creation





#### **4. We also hear with our eyes**

In most parts, acoustics are about sound and its influence on human performance. It is, so to speak, the ear that should be satisfied by acoustics. But human beings do also take in their environment with their eyes. You should, therefore, always have the visual impression of an acoustic solution in mind. If you sloppily place raw acoustic panels in a given room with no further thought on design, it can have very negative effects on the people who are using the room. You should, therefore, always accommodate the user's taste and aesthetics in the design of acoustics.

You can do this in many ways. You could, for example, upholster acoustic panels in motifs of the user's choice, use different colours, place it in a frame, contour cut it, or design it modularly so panels can be combined sculpturally. There are many ways to go about it and only the users of a room can decide whether the acoustic solution has the right aesthetic for them.

### **5. Consider future prospects**

It is always worthwhile to consider whether an acoustic solution is fit for the future. How does the organisation look tomorrow? We constantly get new needs and wants and maybe one day we will become tired of the present looks of a solution.

The easy solution to this problem can be found in the above point: make acoustics that strike the aesthetics of the users. You can further secure your projects by choosing a solution that is sustainable and easy to transform or move. Acoustic pictures is a good idea since one can easily change the motifs without having to replace the panels. Likewise, it is, of course, important to buy acoustic materials that are harmless and in a quality that makes them viable for many, many years.

### **Now we can begin!**

Acoustics is a complex science but these 5 tips can give you a practical understanding of how oneself can work with it.

Acoustics can do a lot to a workplace or organization (see for example [this article](#) for concrete documentation of the dramatic effect that acoustics have on schools). If you want to improve physical and mental well-being, increase performance, and decrease sickness, you should get started!

If you have any questions or thoughts, you are, of course, welcome to [contact us](#) in Intelligent Space. We can help you through the process of designing and implementing a sustainable and specially designed solution which is tailored to your needs and wants.

**Besøg os på [www.intelligentspace.dk](http://www.intelligentspace.dk).**



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