Acoustic design according to room type

The purpose of the room is decisive for the acoustic environment to be created. In rooms for speech, such as classrooms and auditoriums, it is important to ensure a good level of sound spreading, whereas rooms for concentrated work require a high level of absorption.

Class Rooms

Acoustic considerations
In a class room, it is important to ensure good speech and listening comfort. The most important aspect in achieving listening comfort is the audibility and clarity of consonants. This is due to the fact that comprehension of speech is dependent on consonants. In addition, interfering noise must be reduced so that it does not drown or “mask” the relevant sound. Speech comfort is ensured by creating a sense of reverb in order for the rhetoric effects to be used. If too much sound is absorbed, the rhetoric effects of the speech will disappear. If too little sound is absorbed, the noise will impede the listening comfort.

Acoustic design

Rectangular room, 50 to 70 m².
Ceiling height max. 3 m.

Room dimension may not be close to or exceed 1:2.

Ceiling: acoustic materials with sound absorbing and diffusing properties, as well as a small amount of reflexion.

Walls: sound absorbing materials with diffusion characteristics.
ACOUSTIC CONSIDERATIONS
Open learning is often used in stead of traditional class rooms. Therefore, acoustic environment has to be charac-
terised by good listening and speech comfort, as well as privacy as teaching is based on group work. The most es-
sential acoustic criteria, however, is the privacy between the groups. Most of the work is done in groups which is why the speech and listening comfort within short distances or within the group is of importance.

The privacy between the groups is achieved by applying sound barriers. Open learning must also enable communi-
cation over large distances, e.g. briefing from the teacher to the entire class. This may seem as a challenge as the sound spreading must be reduced as much as possible. It may therefore be necessary to use a microphone which limits the speaker’s possibility of using rhetoric effects.

ACOUSTIC DESIGN
It is important to create discontinuous ceiling and wall surfaces, both as structures, inclinations or curves.

Alternatively, the groups should be separated by room dividing elements, stretching from the ceiling to the floor. Hard surfaced elements that reflect sound should be avoided or equipped with sound absorbers.
SPORTSHALLS

ACOUSTIC CONSIDERATIONS
Sports halls have to give the impression of being full of activity. The sound environment is therefore lively, meaning the reverberation time is very long.

Long reverberation times in sports halls are allowed since the verbal instructions are limited. In addition, the lively atmosphere in such premises is of higher important than the listening comfort.

ACOUSTIC DESIGN
It is difficult to provide an adequate amount of sound absorption by placing the acoustic materials in the ceilings. This is due to the fact that only a few of the sound waves are likely to reach the ceiling surface. Applying the sound absorbers on the walls ensures spreading of sound and helps preventing echoes which are very audible in large sports halls.

DAY CARE ROOMS

ACOUSTIC CONSIDERATIONS
In day-care rooms, noise control has the highest priority as much of the communication takes place over short distances. It is though advisable to divide the rooms in smaller units or to organise the children in smaller groups which would effectively contribute to the noise control efforts.

ACOUSTIC DESIGN
In day-care rooms, it is important to limit the room volume as much as possible, by limiting not only the floor area but also the ceiling height. The ceiling height should not exceed 3m. Sound absorbers are placed in the ceiling and to a large extent on the walls too. The sound absorbing materials are naturally required to be robust.
OPEN PLAN OFFICES

ACOUSTIC CONSIDERATIONS
Open plan offices are best suitable for employees with related work functions and the occupations requiring visual and verbal contact. The most important acoustic measure is sound separation. The interior fit-out plays therefore an important acoustic role.

In addition, personal relations have a decisive influence of the perception of sound versus noise. It is thus in some cases required to plan the fit-out on a more individual level.

ACOUSTIC DESIGN
It is important to create discontinuous ceiling and wall surfaces, both as structures, inclinations or curves.

Hard surfaced elements that reflect sound should be avoided or equipped with sound absorbers.

Alternatively, the groups should be separated by room dividing elements, stretching from the ceiling to the floor.
INDIVIDUAL OFFICES

ACOUSTIC CONSIDERATIONS
Acoustic regulation in small individual offices rarely poses a challenge as the furniture often provides the necessary sound diffusion making the sound absorbers in the ceiling sufficiently effective.

ACOUSTIC DESIGN
The sound in small rooms with large ceiling height might seem like a garage sound. The wall surface above the normal ceiling height should therefore be equipped with wall absorbers.

LECTURE HALLS

ACOUSTIC CONSIDERATIONS
Speech intelligibility and rhetoric must be in focus in lecture halls. Ideal acoustic conditions are ensured by creating a sonorous room – a rich sound environment with a hint of resonance. Furthermore, good sound diffusion is necessary in order to spread the consonants to the audience.

ACOUSTIC DESIGN
Lecture halls must be fitted with sound reflecting elements above the speaker. In addition, it is important to enable sound to be angled so that it can reach the audience.

Sound absorbers are mounted at the back wall. The ceiling can be created as a serrate shape that prevents the sound from being reflected back to the speaker.
HOSPITAL WARDS

ACOUSTIC CONSIDERATIONS
In hospital wards the goal is to create an environment consisting of comforting sound where the unsettling sounds are filtered. This, however, is a challenge as hospitals are “contaminated” with all sorts of sounds throughout the day, and it is difficult to find rest and create a recreational area. Acoustically, sound separation and a living room atmosphere are the most suitable solutions for hospital wards.

ACOUSTIC DESIGN
Rectangular room, 50 to 70 m². Ceiling height max. 3 m.

Sound absorbers should preferably be mounted on the ceiling. Interesting, dynamic ceiling lines are advisable as many patients spend much of their time looking at the ceiling.

CORRIDORS

ACOUSTIC CONSIDERATIONS
At the same time, corridors are connectors between other rooms, and as such they are part of the sound zoning that creates the acoustic coherence between the individual environments. The noise in corridors is usually generated by footsteps. However, corridors have also become a space for informal conversations which automatically creates noise barriers and efficient sound absorption.

ACOUSTIC DESIGN
Staggered, discontinuous course and varying room volume will prevent high levels of noise.

Absorbing materials must be placed directly opposite large openings in the corridor walls.