BIAP recommendation n° 09/4 : Speech intelligibility in class rooms

Introduction

For the process of teaching in optimal conditions, it ought to occur in school rooms with a good speech intelligibility .

Among other requirements, the acoustic conditions are to have the priority, so as the oral message of the teacher arrives in a clear condition to each pupil, and the reversal..

There are two acoustical impediments that affect the oral transmission: the background noise and the reflections in the inner surfaces of the room; these two harmful agents diminish the intelligibility of speech.

To obtain an optimum score of intelligibility in the class rooms, the noise inside the room must be controlled and an adequate reverberation time for the good transmission of speech must be achieved.

Recommended values of noise inside the room should not exceed the following levels, according to its use:

Type of room	Noise levels in dBA
Class room	40
General use room	50
Quiet room, babies room	35

Acoustic insulation

The achievement of the above noise levels depends on the acoustic insulation of the rooms with respect to the external environment, mainly if they are placed in zones with high road, railway or aircraft traffic; it also refers to the acoustic insulation with respect to the contiguous rooms or other spaces that could be noise sources, for example the corridors, staircases, etc.

The recommended values for the acoustic insulation of the outer walls (including windows and doors and ventilation systems) and ceilings of the room are indicated in Table 1:

Table 1.- Recommended values of acoustic insulation between rooms and external environments or rooms

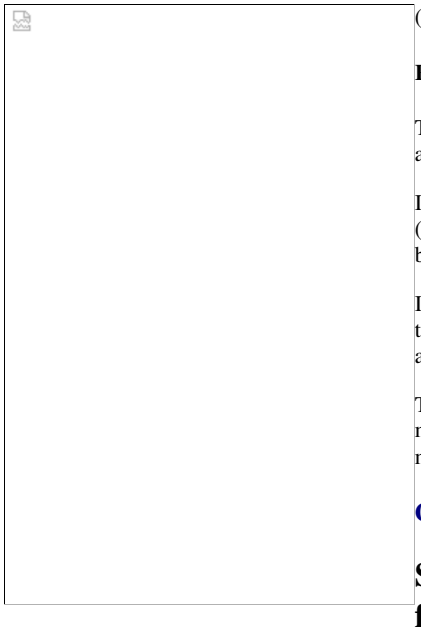
Separating wall/ceiling/floor	Acoustic insulation, dBA
Class room / Very noisy outside environment (>80 dBA)	49
Class room / Noisy outside environment	44
Class room / Not noisy outside environment (~70 dBA)	39
Class room / Silent outside environment (~65 dBA)	34
Class room / Class room	44
Class room / Corridors	39
Class room / Staircase	44
Class room / Equipment room	56
Quiet room / Babies room	56

Reverberation time

The reverberation time needed for the class rooms will be achieved by means of an inner treatment of adequate absorbing acoustic materials and an adequate shape of the class room.

A generally accepted value of the reverberation time T of an empty class room of normal dimensions (200 to 1000 cubic metres) is 0.4 seconds, average value for the frequency bands of 500 to 1000 Hz; nevertheless, the optimum reverberation time for good speech intelligibility is a function of the room volume, as specified in figure 1, that gives the values of the reverberation time in seconds versus the volume of the room in cubic metres.

Figure 1: Optimal reverberation time versus volume for class rooms



(mean value for frequencies between 500 and 1000 Hz)

Recommendations to teachers

The teacher ought to speak with a level of emission high enough to be understood, and with a good vocalisation.

In some cases, it would be necessary to use an amplification system for the speakers (teacher and pupils) to enhance the signal-to-noise ratio of the oral message/ background noise, that ought to be of not less than 15 dB.

It is convenient to emphasise that good conditions of the class rooms will avoid both the vocal efforts of the teachers that sometimes need to make themselves understood, as well as the distraction of the pupils that do not understand the oral messages.

Those recommendations ought to be accompanied by talks to the pupils, that would make them aware about the noise problem, with the intention of avoiding them to make noise, that would annoy the surrounding people.

General recommendations

Special care should be put in the selection of the furniture and equipment inside the class room to reduce its noise emission; for example, the legs of tables and chairs must be fitted with felt protectors, slide and overhead projectors and air conditioning systems ought to be as silent as possible, etc.

References

Noise in schools.- World Health Organization. Regional Office for Europe. August 2000.

Noise and health.- World Health Organization. Regional Office for Europe. March 2000.

Community Noise.- B. Berglund and T. Lindvall, editors. Archives of the Center for Sensory Research, vol 2. Issue 1, 1995. Stockholm University and Karolinska Institute.

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