

CLASSROOM ACOUSTICS

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Noise in the class room is more than students talking

Main factors that affect classroom acoustics are reverberation and background levels

RT 60

The design of rooms for speech seems to be critical aspect of the acoustic design of a school. Rooms should be designed to facilitate clear communication of speech between students and teachers as well as between students. Hearing and understanding are important parts of the learning process. A noise classroom can make these things difficult. We need to remember that noise in the class room is more than students talking. There are other factors that make it hard to hear and above all understand in the room. In accordance to Institute of Acoustics a structured approach to the acoustic design of classrooms need to consider following factors:

- Indoor ambient noise levels
- Room size and geometry
- Amount of acoustic absorption needed to achieve the required reverberation time
- Type, location and distribution of that acoustic absorption
- Special consideration for non-standard rooms
- And use of electronic sound reinforcement system.

When the classroom acoustics are poor, it can cause problems with how a student understand speech, reads and spell and even behaves in the classroom, concentrate and pays attention.

Even for periodical check it is recommended to use professional sound level meter which meet requirements of IEC 61672



Main factors that affect classroom acoustics are reverberation and background levels. A classroom with a long reverberation time of several seconds will cause syllables to be prolonged so that they overlap and hence degrade speech intelligibility. Therefore reverberation time is a critical element in speech intelligibility and plays an important role in classroom activities. ANSI Standard S12.60 for Classroom Acoustics addresses the issue of both reverberation time and background noise as well as their effect on speech intelligibility by placing maximum permissible levels on each. Under the standard the recommended reverberation time in unoccupied, furnished classroom for school-age children with is 0,6-0,7. For such measurement SV973 the new sound level meter from Svantek seems to be perfect choice. The reverberation time measurement (RT60) is available in 1/1 or 1/3 octave bands in accordance to ISO 3382 standard. Moreover this function is supported by the Building Acoustics Assistant App for smartphones which can guide you while performing measurements related to acoustics in buildings. For more advanced measurements including sound insulation and speech intelligibility you can use state-of-the-art meters like SVAN 979 and latest version of

SVAN977C. The intelligibility of speech depends upon its audibility and clarity. Audibility is affected by the loudness of the speech relative to background noise level. It is often expressed as a SNR (signal to noise ratio). Background noise is a combination of many factors like ingress noise from external activities (noise traffic for example), classroom equipment (projectors etc.) and general occupancy noise. It is worth to remember that increase in the background noise will cause grater masking of speech and as a result it will decrease speech intelligibility. Recommended background noise levels for unoccupied classroom for school children is 35 dBA in accordance to ANSI standard.



However when classroom is occupied all noise levels increase therefore it is important to keep background noise level to minimum. Even for periodical check it is recommended to use professional sound level meter which meet requirements of IEC 61672. It can be Class 1 or Class 2 instrument like SV973 with wide frequency range and measurement range together with a lifetime warranty for microphone made in the latest MEMS technology. Meter is easy to use thanks to its pocket size and OLED display with fill color and high contrast.

Good classroom acoustics helps both students and teachers therefore it is important to think about background noise and reverberation in any space used for learning. There are some simple ways to make a classroom quieter like hanging curtains or blinds in the windows, hanging appropriate material like corkboards on the walls or even placing soft tips on the bottom of chairs and tables or just turning off noise equipment when it is not in use. Nevertheless before implementing any changes it is necessary to know actual acoustic conditions of the classroom, therefore measurement in this case is crucial.



SV973 Class 2 Sound Level Meter

Background Noise



Background Noise at a given location and time, is measured in the absence of any alleged noise nuisance sources. Also known as background sound and residual sound.

Reverberation Time



Reverberation Time (RT60) is the time required for the sound pressure level to decrease by 60 dB after the sound source has stopped.

A-weighting filter



A-weighting filters cover the full audio range, 20 Hz to 20 kHz, but the filter, 'shape' is similar to the response of the human ear at the lower sound levels

Bibliography:
 Institute of Acoustics Acoustics of Schools: a design guide November 2015
 American Speech-Language-Hearing Association The Noisy Classroom
 Acoustical Society of America S12.60-2010 Part 1