

**A Layman's Guide**

# **School & Classroom Acoustics**

***“Improving What You Hear  
With Greater Frequency”***

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***Good listening is a critical component of good academic achievement and behavior.***

The most common complaint concerning educational facilities focuses upon excessive noise and poor acoustics. A 1994 GAO survey indicated that 28% of the school administrators chose acoustic concerns as their primary complaint.

Children (under the age of fifteen) have not developed the hearing skills of an adult. We know that the auditory paths of the brain need time to mature. A 1982 study examined the loudness or intensity required for people of different ages to achieve 100% listening accuracy to speech in a quiet setting. Adults required 11 decibels above the background noise to understand the spoken word. The same study concluded that 10-year old children require 18 decibels; 5-year-old children require 25 decibels, and 3-year-old children require 38 decibels of speech sound level above background noise to attain the same speech recognition of an adult. This is applicable to all children, not just those with hearing loss.

Investigating the “typical” classroom environment, a recent study indicates that distance between the sound source and the pupil is critical. With a teacher speaking at a level 6 decibels above the existing noise, students recognized 89% of the single syllable words spoken when they were within 6 feet from the teacher. At a distance of 12 feet recognition fell to 55%. Alarmingly, **when students are placed at a distance of 24 feet from the speaker, recognition of the spoken word fell to only 36%.** With students placed in small work groups every student is at a listening disadvantage for a portion of the school day.

A particular problem with young males occurs when they are required to focus on one of several sounds. Most adults have developed the skill of “dichotic” listening (they are able to concentrate on only one sound and disregard the unimportant). Tests have shown that this skill develops sometime during puberty in male children. Could environmental noise distractions contribute to Attention Deficit Disorder ?

Many teaching professionals are aware of poor acoustic conditions in large assembly areas such as cafeterias, cafetoriums, gymnasiums and music rooms. These areas are classrooms as well, but due to the volume of space, poor acoustics are more noticeable.

## WHY HAVEN'T WE ADDRESSED ACOUSTICS BEFORE?

Years ago schools were designed for teachers lecturing to straight rows of quiet, attentive students. They were not designed for group learning, hands-on science, or math manipulatives. When most of our school buildings were constructed computers and modern video aids were unheard of. Schools 50 years ago were constructed with low-velocity ventilating systems that were mostly inaudible. Modern HVAC systems use high air speeds (more audible), have narrow ceiling ducts (radiate noise) and employ air conditioning.

Building materials such as wood floors, plaster on lath ceilings and plaster cavity walls have been replaced with vinyl tile on concrete, suspended inexpensive ceiling coverings and ceramic tile or painted concrete block walls. Studies conducted by the D. H. Kaiser Co. indicate that rooms constructed prior to 1950 (while not perfect by modern standards) are somewhat more acoustically friendly. It is clear that common modern architectural design and materials are a major factor causing poor acoustic conditions in our school buildings.

### THREE FACTORS USED TO SIMPLIFY ACOUSTICS

**Sound reverberation** is the remainder of the sound that continues in a room after the source has been stopped. Excessive reverberation makes speech less intelligible for all students. Often "*I can't hear*" means "*I can't understand*". Reverberation is expressed in seconds and represents the time required for a source sound to decay by 60 decibels.

**Background Noise** from external or internal noise sources compete for the student's attention. External noise comes from car traffic, airplanes, construction, school playgrounds, outdoor mechanical equipment etc. Noise from areas surrounding the classroom, such as the cafeteria, gymnasium, corridors and other classrooms is quite common. Internal noise may be generated by student activity, talking or heating and cooling equipment.

**Signal to noise ratio** describes the difference in intensity between the desired sound and the background noise.

The American National Standards Institute, Inc. has adopted a national standard "*Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools*" (ANSI S12.60-2002). For more information about this new development - please contact the D. H. Kaiser Co.

## ***Why D.H. Kaiser ???***

### ***Economical Scientific Methods***

- Computer Analysis
- Recommendations
- Specifications
- Placement Drawings

### ***Simplify Acoustic Decisions***

- Use & Function Assessment
- Color Graphs & Written Documentation
- Guarantee

### ***Utilize All Available Tools***

- Apply Most Efficient Products
- Regardless of Manufacturer
- Design for Sound Reflection & Diffusion
- Employ All Building Products Acoustically

### ***We Offer:***

- 25 Years Experience
- Trained Staff
- On Site Testing
- Large Acoustic Database
- Cost Savings
- Results !!!**

***The D. H. Kaiser Co.***

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