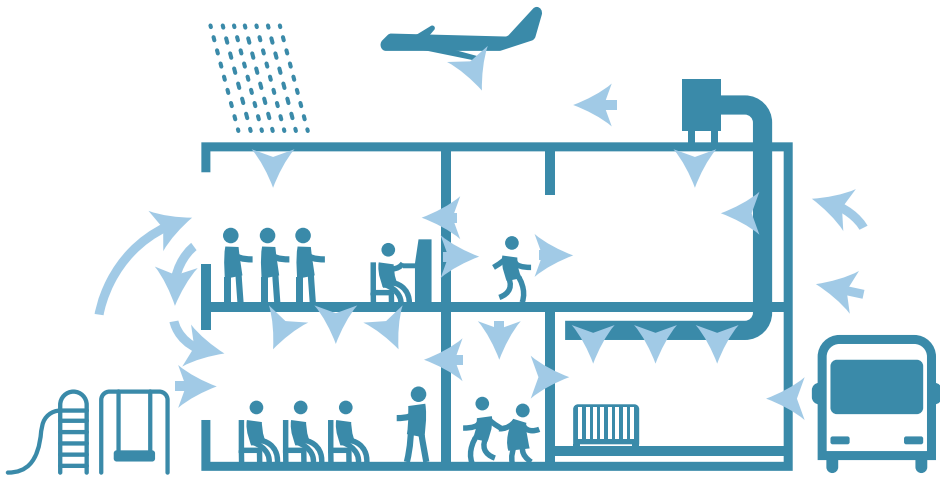


# THE IMPORTANCE OF GOOD CLASSROOM ACOUSTICS



As we build new schools and renovate old ones, there are numerous factors that must be considered in order to optimize the learning outcomes for ALL students.

Children learn in the classroom primarily through hearing the spoken language of their teachers and peers. They can hear clearly, however, only if the room has good acoustics. Classroom acoustics involve background noise and reverberation, the reflection of sounds within a room. Reductions in classroom noise and reverberation significantly benefit students, especially those with hearing and listening problems. Required limits on noise and reverberation which support classroom learning are provided in standards such as ANSI/ASA S12.60.



**Classroom Causes of Noise:** HVAC units • Electronic equipment • External classroom noise • Outside noise • Lighting • Classroom pets • Plumbing • Noise generated by students

**Classroom Causes of Reverberation:** Sounds reflecting off primarily large, flat, hard surfaces such as sheet-rocked walls and ceilings

Note: When choosing a new HVAC unit or treating an existing unit, it's important to consider how HVAC noise contributes to poor classroom acoustics.

## ANSI/ASA S12.60-2010

These are the accepted standards for classroom acoustics required by the American National Standards Institute and the Acoustical Society of America.

	NOISE LEVEL	REVERBERATION TIME
≤10,000 cu ft	35 dBA	.6 seconds*
>10,000 cu ft	35 dBA	.7 seconds
Relocatable Classroom	35 dBA	.5 seconds

\*Classrooms should be built to be adaptable to a .3 second reverberation time for children with hearing problems or other special listening needs

## PROPERTIES OF CLASSROOM ACOUSTICS

### NOISE

Any sound that interferes with what an individual wants/needs to hear. Background noise should be kept as low as possible.

### SIGNAL-TO-NOISE RATIO

The relationship of the intensity of a desired sound (e.g, speech, music) to background noise. Noise should be reduced so that the desired sound is louder by at least 15 dB. This is referred to as +15 dB speech-to noise ratio.

### REVERBERATION

The repeated reflection of sounds off hard, flat surfaces in a room. How long sound reflections take to subside is called the reverberation time. Since these reflections can muddle the original sound, classrooms should be designed so these reflections subside quickly. Reducing this time is accomplished by placing sound absorbing materials in the room, primarily on the large areas such as the ceilings and walls.

### CRITICAL DISTANCE

Speech emanating from a person talking at a close distance creates direct sound energy. As the distance increases from the talker the speech energy contains reflections from the room surfaces. Critical distance is where the direct sound energy and the reflected sound energy are heard equally. Within this critical distance a student should hear the talker most clearly, which is especially important for students with hearing and listening problems.

## WHO IS MOST SUSCEPTIBLE?

Poor classroom acoustics certainly affect ALL students, however there are individual students who are at higher risk for learning difficulties as a result of excessive noise.

- Students with any permanent or fluctuating hearing loss. Ear infections are particularly common in young children
- Younger students
- Children with auditory processing disorders
- Children with learning disabilities and developmental delays
- Children with articulation and language disorders
- Children with attention deficits
- Second language learners

## WHO TO CONTACT?

Your School District's educational audiologist is an excellent resource when seeking more information on classroom acoustics. These professionals are able to comment specifically on acoustical conditions in the schools. You may also contact your state's chapter of the American Academy of Audiology, American Speech Language Hearing Association, or the Educational Audiology Association at [www.edaud.org](http://www.edaud.org).