

Meeting ANSI Standard S12.60 Requirements

Designing a classroom to meet the acoustical requirements of the ANSI standard is neither difficult nor costly. The key is including acoustic concerns early in the planning and design stages.

To increase the signal-to-noise ratio, and thereby increase speech intelligibility, either the signal must be increased, which is accomplished by increasing good reflections and reducing undesirable late reflections, or the background noise must be decreased.

The latter is accomplished by either reducing the noise coming into the room through the ceiling plenum, through the walls and from the HVAC system, or decreasing the noise in the room by adding sound absorbing materials. Ideally, both halves of the ratio are addressed.

With this in mind, general guidelines for reducing reflected sound as well as background noise are described below.

Reducing Reflected Sound – The level of reflected sound and the reverberation time can both be reduced by adding sound absorbing material to a room. As a result, the locations of sound absorption treatments are important considerations for good acoustical characteristics in learning spaces.

For classrooms where there is no fixed lecture position for the teacher, such as those for lower grades, and where ceiling heights are less than ten feet, the best option is to place most, if not all, of the sound-absorbing material on the ceiling.

To reduce reverberation, choose a ceiling panel that has a Noise Reduction Coefficient or NRC of at least 0.70. The NRC indicates the average percentage of sound that a ceiling absorbs and is expressed as a number between 0.00 and 1.00. For example, an NRC of 0.80 indicates that the ceiling absorbs 80% of the sound that strikes it.

When ceiling heights are greater than ten feet, which is generally

discouraged for classrooms, an increasing amount of the sound-absorbing material will need to be placed on the walls, as the wall height increases above ten feet. Acoustical wall treatments frequently take the form of one-to-two-inch thick, vinyl or fabric covered fiberglass panels.

If the bulk of the installed sound-absorbing material is on the ceiling and there is no possibility for wall treatment, installed furnishings such as bookshelves, assure that sound waves traveling across the room are scattered, thereby reducing the possibility of distinct echoes.

Carpeting can also help reduce reflected sound, although not nearly as much as the ceiling, because it is generally poor at lower frequencies and because most carpets used in schools have an NRC lower than 0.25. Thus, carpeting alone usually does not provide enough sound absorption for classrooms. What it can do is help reduce background noise from chair and foot impacts or scuffing. Carpeting can also reduce the transmission of this impact noise to the room below.

Reducing Noise Traveling Through the Plenum – Walls do not always extend all the way up to the finished deck of the floor above. Instead they often stop at the suspended ceiling line. As a result, noise in an adjacent space can reflect off the deck and bounce back down through the ceiling into an adjoining classroom.

To help reduce this type of noise intrusion, choose an acoustical ceiling panel that has a high Ceiling Attenuation Class or CAC value. The CAC indicates a ceiling's ability to block sound between two rooms that share a common plenum. The higher the number, the better the ceiling acts as a barrier to airborne sound transmission.

In addition to higher CAC ceiling panels, other solutions include backloading the suspended ceiling with fiberglass insulation batts, or

installing a gypsum board plenum barrier between the adjacent rooms.

Reducing Noise Traveling Through the Walls – In the past, interior school walls were built of brick or concrete block, so intrusion of sound through a partition wall was not much of a problem. Today, the use of thinner, more lightweight wall materials are the norm and noise intrusion must be addressed.

According to the new ANSI standard, the minimum Sound Transmission Class or STC of a wall separating two adjacent classrooms is 50. The STC indicates the ability of a wall construction to block sound. The higher the number, the better the performance.

Most non-movable walls today are constructed of a layer of gypsum board, an air space and another layer of gypsum board on the other side. Adding fiberglass insulation in the cavity between the layers will reduce noise transmission, as will adding a second layer gypsum board to each side. Sealing all gaps between the walls and the floor and ceiling, as well as any openings in the wall such as piping, electrical outlets, and HVAC registers will reduce noise transmission even more.

Reducing HVAC Noise – The main source of background noise in classrooms is usually an HVAC system. In terms of acoustical design, a centralized system is much better than window or room units. Room units contain fans that are usually loud and difficult to treat with sound absorbing materials due to their position in the classroom.

It is also important to locate air handlers and rooftop mechanical equipment away from critical listening spaces such as classrooms. It is best to locate them over spaces that are inherently noisy, such as corridors, cafeterias and gymnasiums. Positioning units over hallways and then running ducts to nearby classrooms is also a good practice.