

Sound Advice

Helpful Information from *Stewart Acoustical Consultants*

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New Acoustical Standards for Classrooms

by Noral D. Stewart

A new standard for acoustics of classrooms (ANSI S12.60) originally adopted in 2002 and revised in 2010 is expected to be implemented in future building codes and federal regulations. Parts of it are already being used in LEED for Schools. This standard recognizes the need for lower noise levels and reduced reverberation by young children and those with hearing difficulties or who are listening to a second language, though it stops short of providing ideal conditions for these populations. The requirements cover three areas: room reverberation, noise, and isolation between rooms.

Reverberation times are limited to 0.6 seconds in classrooms up to 10,000 cubic feet and 0.7 seconds in rooms of up to 20,000 cubic feet. Calculations by methods outlined in the standard must show these limits met in the furnished but unoccupied classrooms at 500 Hz and higher frequencies. A tolerance of 0.1 seconds is provided if the reverberation time is measured, though this is not required. The use of carpet or absorptive wall panels in the room can reduce the requirements for the ceiling panel. Otherwise, typical smaller rooms less than 10,000 cubic feet will require at least NRC 70 panels for a nine-foot ceiling, or fiberglass panels (or a NRC 70 panel with very good 500 Hz absorption) for a ten-foot ceiling. Rooms of more than 10,000 cubic feet may be acceptable with certain NRC 55 ceiling panels even without carpet or wall panels if the ceiling is kept at nine feet. A ten-foot ceiling in larger rooms will require at least an NRC 65 panel or some carpet or wall panel. Higher ceilings will typically require fiberglass ceiling panels or some carpet or wall panels.

The HVAC sound level is to be not more than 35 dBA, with a difference of not more than 20 dB between the A-weighted and C-weighted levels. This is most easily achieved with backward curved or airfoil fans operating at low static pressure. Forward curved fans increase the difficulty because of their strong low-frequency noise. Silencers or duct lining are essential. The consensus is that these goals cannot be achieved with fans in the classroom, such as unit ventilators, through-wall units, or fan-powered boxes over the ceiling. Valve boxes are possible. Flow velocities must be limited to 1000 feet per minute in classroom trunks, and 400 feet per minute in branches. Diffusers must be selected with catalog ratings below NC 20, and plenums above them must be deep enough to allow straight flow into the diffusers to achieve rated performance. In the event the classroom is affected by transportation noise, this limit of 35 dBA applies as an hourly average level to the total of all noise, unless the transportation noise is above 40 dBA less than 10% of the time, in which case the limit is raised to 40 dBA for the hourly average level.

Isolation between classrooms has not been a major problem in the past but will become one with new goals for room absorption and HVAC noise. The isolation requirement of an effective STC 50 between classrooms eliminates the currently common use of plenum air returns and walls that end above the acoustical ceiling. Open plenums above the ceiling between classrooms will not provide adequate isolation with the reduced levels of HVAC noise in the new standards. This is especially so if fiberglass ceilings are used. Gypsum walls must include batts in the cavities, either light-gauge studs or resilient channel, and an extra layer of gypsum on one side. Masonry walls will require extra attention to details and probably furred gypsum on one side. As always, music rooms require special attention. A concrete floor and suspended ceiling will normally provide adequate blockage of airborne sound between floors for normal classrooms. However, special attention may be required for footstep sounds where carpet is not used on the floor above.