EXCLUSIVELY FACILITY MANAGERS
Today's FACILITY MANAGER

The HVAC Factor: How Does That Sound?

In education facilities, acoustical considerations can impact learning.

June 2012 | Aaron Bétit

As the focus on quality of education and the condition of schools increases, the acoustics of classrooms has taken a front seat in the evaluation of existing and future facilities. Excessive background noise within classrooms can distract students and make it difficult to hear instructors. Replacing existing systems and designing future buildings with acoustics in mind can help improve student comprehension as well as overall operation costs.

It is important to provide distance between classrooms and noise generating mechanical equipment. Acoustically speaking, fan coil units in ceiling and window air conditioning units are difficult (if not impossible) to mitigate adequately. Addressing the low frequency noise generated by air moving equipment requires either mass to contain it or distance to permit low frequency noise to dissipate into unoccupied or non-critical areas. By allowing low frequency noise to radiate into non-critical areas, less substantial structure is required, which reduces construction costs and noise within a classroom.

If possible, air moving equipment should be located outside of classrooms. Designs should include noise buffer areas to help isolate sensitive spaces from noise generating rooms. Typically, locations used as noise buffer spaces include storage areas, corridors, copy/print rooms, and telecommunication closets.

Noise generating spaces that facility managers (fms) should consider isolating from classrooms include air moving equipment, condensers, elevator shafts, and projectors. And fms should evaluate these adjacencies in both the vertical and horizontal aspects. In plan view, an air handling unit directly adjacent to a noise sensitive space stands out as a potential problem. It is also necessary to avoid placing vertical discharge units directly above the noise sensitive space. Although these spaces are easier to waterproof, in the long run the amount of mitigation required to attenuate the noise generated by this condition often results in higher construction costs.

If it is not possible to relocate air moving equipment outside of classrooms, then mechanical rooms can be created within a ceiling plenum or in a classroom closet. Shoehorning an acoustical enclosure around the fan coil unit, ensuring there is a fire rated access hatch, and providing a 3' low pressure drop on the inlet and outlet of the unit can all help to reduce the existing building system's noise level. If possible, a shaft wall consisting of two layers of 5⁄8" drywall, a CH stud with batt insulation, and a 1" coreboard should be used. It is important that the shaft wall enclosure be airtight, with all penetrations (ductwork or otherwise) sealed

tightly with batt insulation and silicone caulk.

Meanwhile, ductwork should be designed for low velocities to promote laminar flow. When fluid moves in undisrupted parallel layers without lateral mixing, it is considered laminar flow.

Laminar flow is important for two reasons. Turbulent air requires more force to move, demanding larger fans capable of overcoming higher pressure drops; consequently, this generates more noise. Turbulent air also generates noise. Abrupt changes to the airflow, such as pressure reductions, turns, and take offs should be avoided. For critical spaces, wide ducts with smooth transitions are required.

Installing quality air moving equipment that operates more efficiently usually results in lower sound levels. In addition, rethinking the traditional HVAC system approach can help reduce operational costs while improving ambient noise conditions within a building. Different approaches to traditional building design, such as chilled beams, can help reduce the airflow requirements while providing the same result in temperature control.

Fms should also evaluate all factors when considering a packaged unit approach. While a package system may present a lower construction cost, these savings may be offset by additional structural and noise mitigation measures required due to higher sound levels generated by the packaged units.

Increasingly, minimizing the background noise heard within classrooms is a concern for many fms working in education facilities. It can be difficult to implement acoustical design practices in existing buildings. Relocating noise generating sources outside of the space is the most effective approach in terms of cost and results. Enclosing the noise generating equipment in enclosures with some degree of mass is the next best compromise.

Bétit is a senior consultant in architectural acoustics and mechanical systems at Acentech Inc., a multidisciplinary acoustics, audiovisual systems design, and vibration consulting firm. He is based in the firm's Westlake Village, CA office.