Code Talkers

Healthy Indoor Air and ASHRAE 62.1

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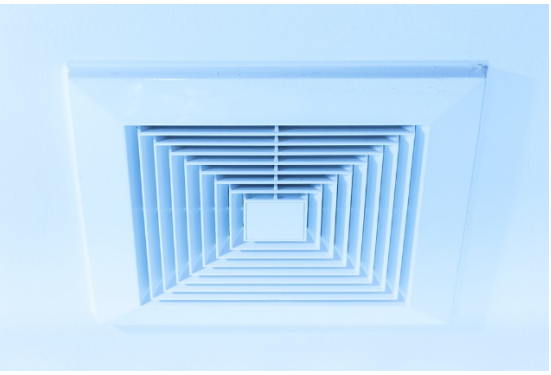

As the chair of the APPA Standards and Codes Council, I see firsthand how the work of this council supports educational institutions. Most of the time, the work involves microsurgery of the intellectual, philosophical, scientific, and engineering narrative of the lessons we have learned, while we strive for perfection in addressing the health, safety, and environmental concerns of our facilities.

Most of us in the facilities management world do not like new standards that eventually become code, because we cannot get the funds needed to adapt to them proactively. As a result, they just make our jobs more difficult and much riskier professionally as we navigate our responsibilities and try to live up to what is expected of us! We always seem to be caught between a rock and hard place. The leadership do not want to hear about all the cost-related standards that make things better, but if a problem arises because of not following these developments, we are called on the carpet for not warning them that such a problem could occur.

Keeping Your Eye on Outside Air

COVID-19 has drawn our attention to an important aspect of educational facilities that has been largely neglected until now—outside air (OA). There are many reasons that OA historically hasn't gotten much attention: It is exceedingly difficult to manage without proper controls; it requires more energy to support; OA components must be repaired and adjusted often; it makes buildings uncomfortable in various circumstances; and if it is not working properly, or at all, no one will know. As a result, the "nuisance" of OA has been forgotten.

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 62.1, "Ventilation for Acceptable Indoor Air Quality," is the industry standard for introducing OA into buildings, which is a major factor in achieving the healthiest possible indoor

air. The 62.1 standard was first published in 1973 and applied to highly populated and transient occupancy facilities. Shortly after, cities began adopting it in their mechanical codes for large facilities with exceedingly high occupancy loads. It has only been required by most cities for smaller, residential type units in education facilities during the last decade, and it is now trickling into rural areas.

Virus Dilution

As COVID-19 has been around for a year now, it is likely that everyone knows about OA/virus dilution and the more expensive high-performance filters required to increase dilution. Education institutions want to at least move toward the highest standards of healthy indoor air, even if it must be done incrementally. There is the temptation to add plug-and-play devices into the air handlers to provide sanitation, but we have to take the first step in making sure the HVAC system is running properly to begin with, so that these devices will work as intended. Ensuring HVAC systems are fully operational and that they comply with current codes and with the nearly 50-year-old ASHRAE 62.1 standard is the best starting point for prevention of aerosol transmission of infectious disease in education facilities.
The basic scope of ASHRAE 62.1 (which was updated in 2019) is simple:

2. SCOPE

2.1 This standard applies to spaces intended for human occupancy within buildings except those within dwelling units in residential occupancies in which occupants are nontransient.

2.2 This standard defines requirements for ventilation and air-cleaning system design, installation, commissioning, and operation and maintenance.

2.3 In addition to ventilation, this standard contains requirements related to certain contaminants and contaminant sources, including outdoor air, construction processes, moisture, and biological growth.

Here is where most education facilities have problems. Small-to-medium-sized institutions often use packaged rooftop units (RTUs), which include all HVAC components in one package. Large campuses will always have some stand-alone facilities that use them. These facilities are required to have exterior OA dampers built into them that are fixed in place at the percentage required by law (ASHRAE 62.1) for mixing OA into the space that the unit is providing ventilation for. However, these facilities also supplement their RTUs with residential-type split systems that do not have OA dampers built in, and without this they are no longer compliant with the mechanical code for education facilities. Some split systems may have been added after a building was constructed or remodeled, when building inspections were not involved.

Get It Right and Keep It That Way

A complication associated with ASHRAE 62.1 is that it requires special sizing for the HVAC unit so it can properly treat the unconditioned OA. In many climates, OA is humid and requires air conditioning capacity to dehumidify the air for comfort. Facilities in larger campuses generally feature the more robust building automation systems (BAS) controls to monitor people

loads, so they can automatically modulate the outside damper and adjust the amount of OA coming into the space as needed. In those facilities, OA is minimized if there are fewer occupants in the spaces. All facility HVAC systems and exhaust fans are designed to work as one system, building-wide and symbiotically, to comply with ASHRAE 62.1.

Most RTUs do not have special controls onboard, and the residential split-system units are almost never sized properly to add the ducting, or to include the controls. As a result, there are often discomfort complaints and/or the units run inefficiently; maintenance or contractor technicians have been known to close the OA dampers to resolve these complaints because otherwise the unit seems to be operating as designed. Or there may be a maintenance issue that requires temporary closure of the damper until resolved, but the technician forgets to open it back to the proper setting, and now the unit is no longer providing the required OA.

ASHRAE 62.1 has a prescribed maintenance schedule that is broken down into various tasks; the schedule recommences every five years. The most reliable verification of appropriate maintenance is a deep visual inspection by a third-party consulting engineer or by staff with expertise in HVAC who are not affiliated with performing the maintenance, for accountability reasons. This inspection should take place every five years.

Air Changes and Filters

Finally, one of the important criteria in ASHRAE 62.1 is "air changes per hour" (ACPH), which is measured for the purpose of virus dilution with OA and filtration of air entering or recycled into the space. ACPH is defined as a measure of the air volume added to or removed from a space in one hour, divided by the volume of the space. The ACPH is determined by room size and the proposed type of use(s) (e.g., classroom, auditorium, gym, etc.). The size of the HVAC system is determined by how many times all the air inside a room needs to be treated by the HVAC system.

In view of the air-change criterion, is there an advantage to higher-grade filters such as MERV 13s? In less sophisticated systems, these air-restrictive filters will cause a pressure drop in the ducts, resulting in less air flow and fewer air changes. In addition, the airflow restriction will put a strain on the HVAC system, increase electricity cost, and shorten the life cycle of the unit. Thus, they may do more harm than good.

Pointing up the value of simply addressing ventilation, the California Department of Health has stated, "If there was no ventilation and no filtration, the risk of long-range airborne infection would be over six times as high as that for a classroom with code-required ventilation and a MERV 8 filter (i.e., ASHRAE 62.1)."

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