

Scope: This document provides information on the management of indoor air quality (IAQ) in schools to improve environmental conditions for school staff and students. It offers guidance that will help prevent IAQ issues and assist in solving or remediating problems as they arise. The primary audience for this guidance is those responsible for providing a safe and healthy environment within school buildings, though it will provide helpful insight to others. For maximum efficiency, LEAs are encouraged to use the guidance provided to proactively prevent issues and improve conditions.

Introduction: Outdoor air pollution can have negative impacts on human health, and indoor air pollution, if mismanaged, can have significant health impacts. According to the Environmental Protection Agency (EPA), each day one in five Americans occupies a school building with the majority being children. Air pollutants present indoors may be two to five times that of the outside air and can occasionally reach levels as high as 100 times. Many potential IAQ factors can exist in schools, such as animal dander, mold, dust, dirt, and leaks, to name a few. If mismanaged these can lead to many different health impacts including coughing, eye irritation, headaches, allergic reactions, and aggravated asthma.

Successful IAQ management programs take time to develop and implement; IAQ management plans should aim for continual improvement, utilizing state-of-the-art practices as they arise. This allows a flexible response to changes in IAQ management needs.

According to the EPA providing healthy IAQ is proven to decrease student and teacher absences due to IAQ-related sickness and to promote improved productivity and focus for building occupants.

Plan and Internal Team Building: Establishing an effective team to develop and implement an IAQ plan is the first step in successful IAQ management. A coordinator should be selected, and the team built up from there depending on the size of the building and the issues present. Select team members whose job function and knowledge equip them to address IAQ. The goal is to have a diverse team that can be flexible and effective.

Regular inspection and maintenance are essential for IAQ, so standard operating procedures should be in place to verify that this is done consistently. A schedule is another key piece to completing IAQ-related procedures with regularity and on time.

Ventilation: Maximizing ventilation within the system's capabilities helps reduce pollutants while also limiting the spread of viruses and bacteria by diluting the indoor air with fresh air. The ventilation rates will consider outdoor air quality factors when deciding on the optimal amount of outdoor air. School heating, ventilation, and air conditioning (HVAC) systems should operate to provide a minimum outdoor air ventilation rate based on room and class size that meets current guidance from the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). Ensure the HVAC system is in good repair. Routinely check air intakes for blockages, damage, and infiltration of unwanted items and pests. Verify the system is operating efficiently and performs at the designed air exchange rates. ventilation.

The ventilation rate can be increased during temporary situations that have a negative impact on IAQ. Monitoring for carbon dioxide (CO₂) can be a useful indicator of how well a space is ventilated. AHSRAE guidance 62.1 appendix D uses 700 parts per million (ppm) above the

outside levels as an indicator that a space is inadequately ventilated. ASHRAE guidance 62.1-2007 provides the formula for airflow rates based on CO₂ concentration. When painting, schedule painting during breaks (summer, winter, spring) to reduce prolonged exposure, select low-VOC or zero-VOC paints, ventilate thoroughly before, during, and after painting to flush out VOCs. While VOC paint is common for refreshing school interiors, its use can compromise IAQ and pose health risks, especially to children. Switching to low-VOC or zero-VOC alternatives is a proven way to improve indoor air quality, protect vulnerable populations, and support a healthier learning environment. While performing renovations, or actions that release air irritants it is recommended to increase ventilation temporality to dilute the irritants present in the air.

Air Filtration: When in good repair the building's HVAC system filters out a large percentage of particles from the outdoor air brought into the building. Utilize current ASHRAE guidance or industry best practices to address specific outdoor air contaminants and nuisance dust present so they are not brought into the building at levels of concern. An observational survey of the outdoor air quality during operating hours can be done to identify any sources of contaminants of concern in the local air.

Carbon Monoxide: Carbon monoxide (CO) levels should follow the NIOSH recommended exposure limit of no more than 9ppm per hour for a duration of 8 hours with no one hour exceeding 35ppm. The goal for ideal IAQ should be set at the outside reference level. Delaware has state-level idling regulations that apply to buses and often limiting idling to a few minutes and allowing exemptions for extreme cold. Sample school bus idling policy; https://www.epa.gov/sites/default/files/2017-08/school-bus-sample-idling-policy-9-15-15_3.docx

Temperature and Humidity: Indoor temperature is recommended to be maintained within an optimal comfort zone of 72–79 °F in summer and 68–73 °F in winter. This ensures occupant comfort and decreases issues caused by excessive temperatures, such as decreases in focus and attention for students and teachers. This temperature range also reduces the potential for condensation to form on cold surfaces (piping, exterior walls, roof, or floor.)

Relative humidity should be maintained within 30% to 60% during the school year. AHSRAE guidance recommends keeping the HVAC system in operation year-round and maintaining humidity levels under 65% to prevent moisture developing during extended periods like summer with low occupancy.

Buildings with HVAC systems that have no option to measure or control humidity should utilize other means to measure and display humidity throughout the building. If humidity related issues arise, they must also utilize other means to bring humidity to acceptable measures.

Addressing excessive moisture and water leaks promptly will aid in the control of humidity.

Addressing moisture and spill problems promptly will prevent humidity, moisture, and additional issues associated with spills. Spills should be cleaned up immediately upon notification of the incident.

Cleaning and Building Supplies: Having regular and routine cleaning will improve the overall IAQ of the building. Have set cleaning procedures indicating when cleaning will be done and include the proper use of cleaning materials. Cleaning materials should be stored in designated areas and capped when not in use.

The choice of cleaners, paints, and insecticides used inside the school heavily affect IAQ. Many cleaners can cause skin, eye, and respiratory aggravation when used indoors. Choosing cleaners that are more friendly to IAQ. This includes cleaners that do not have a harsh smell and that leave elevated VOCs after use. Those with fragrances, along with air fresheners and perfumes should be avoided as many can be irritants.

Pest Management: A less considered factor that affects IAQ is the presence of pests and the issues associated with infestation. Effective pest control in schools requires a child-safe, preventive, and sustainable approach that minimizes health risks while addressing infestations. Establishing an Integrated Pest Management (IPM) plan will greatly assist in providing a safer IAQ environment. IPM combines monitoring, prevention, and targeted control to reduce pest populations without over-reliance on chemicals. A good IPM Plan includes:

- Inspection & Identification: Regularly check for pests in cafeterias, classrooms, lockers, gyms, dumpsters, and exterior areas U.S. Environmental Protection Agency.
- Eliminate Attractants: Restrict eating in classrooms, keep food and water sources sealed, and clean gutters to prevent water-related pests U.S. Environmental Protection Agency+1.
- Seal Entry Points: Repair cracks, install door sweeps, screen windows, and keep plants at least 2–3 feet from building foundations Healthy Schools Network.
- Sanitation: Clean lockers, pressure-clean food service areas, and remove clutter.
- Maintenance: Keep landscapes trimmed, sidewalks clear, and exterior conduits sealed.

Maintenance outdoors can directly benefit IPM. Pruning the branches of shrubs and trees away from the building can help eliminate pest access into the building. Ensure drains are working properly, and that water is directed away and adequately drained from the building and other structures. Avoid the use of excess fertilizer that can attract pests to the property. If possible, select a mixture of turf types that are adapted well to the school's outdoor environment.

The environmental conditions maintained indoors can also impact IPM. Having designated areas where food is allowed reduces the number of areas with food waste that can attract pests. Storing trash properly and away from doors will attract less pests. Keep areas as dry as possible and empty any containers that have standing water. Reducing clutter and eliminating excess paper, packaging, and boxes will allow fewer areas for pests to hide.

Animals in Classrooms: There are many educational reasons to keep animals within certain classrooms, however these benefits should be weighed against the risks of their presence which can have a negative effect on the occupants of the classroom. Choosing animals that produce less dander or are kept in living conditions that introduce fewer IAQ issues is preferred when possible. Best practice is having the animals in the school for as little time as possible. Animal habitats should not be placed near HVAC vents and kept away from ventilation intakes.

Radon: Radon is a naturally occurring radioactive gas from the decay of uranium in the ground. It is widely considered one of the most hazardous indoor pollutants and one of the leading causes of lung cancer among non-smokers. Schools should be tested to assess if radon is a potential IAQ problem. If radon is found in levels of concern mitigation efforts should be enacted as soon as possible.

Asthma: Asthma is a leading cause of school absence, with nearly 14 million missed school days per year in the US. It is estimated by the American College of Allergy, Asthma, and

Immunology to be a loss of \$56 billion every year from students missing school due to asthma-related issues. This causes extra academic strain on both the students and teachers. The number of days missed can be reduced by adopting several best practices in the school environment that improve IAQ and asthma triggers.

Asthma triggers that commonly occur in schools include pests, mold, animal dander, use of certain cleaning products, air fresheners and other chemicals. Executing all the aforementioned practices will help reduce the triggers found within schools.

Indoor Air Quality Monitoring: Establishing and maintaining an indoor air quality monitoring program is crucial to the success of healthy IAQ. Baseline testing establishes a reference point for air quality in each school. Routine monitoring should be performed once a semester during regular operating hours to ensure a continuous healthy indoor air environment for staff and students. Schools will work with industry professionals that are approved by DPH (A list can be found on de.gov/healthyschools) to establish a program which tests for the school's specific indoor and outdoor air quality concerns these include but are not limited to, humidity, ozone, mold spore count, nuisance dust, total VOCs, CO₂, and CO.

Per Delaware Code Title 14 These IAQ monitoring reports must be completed and submitted to DPH and the local and regional Boards of Education by May 1st of every school year. These reports can be submitted to DPH via email to HSPContact@Delaware.gov. These reports can be found for public view on de.gov/healthyschools starting in January of 2027.

Resources:

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). 2022. ANSI/ASHRAE Standard 62.1-2022, Ventilation and Acceptable Indoor Air Quality. <https://www.ashrae.org/technical-resources/bookstore/standards-62-1-62-2>

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). 2022. ASHRAE Position Document on Indoor Carbon Dioxide. <https://www.ashrae.org/file%20library/about/position%20documents/pd-on-indoor-carbon-dioxide-english.pdf>

Environmental Protection Agency (EPA). 2025. Indoor Air Quality Tools for Schools Action Kit. <https://www.epa.gov/iaq-schools/indoor-air-quality-tools-schools-action-kit>

Environmental Protection Agency (EPA). 2025. Reference Guide for Indoor Air Quality in Schools. <https://www.epa.gov/iaq-schools/reference-guide-indoor-air-quality-schools>

Environmental Protection Agency (EPA). 2026. Indoor Particulate Matter. <https://www.epa.gov/indoor-air-quality-iaq/indoor-particulate-matter>

Environmental Protection Agency (EPA). 2026. Identifying Greener Cleaning Products. <https://www.epa.gov/greenerproducts/identifying-greener-cleaning-products>

Environmental Protection Agency (EPA). 2026. Managing Pests in Schools. <https://www.epa.gov/ipm>

American Lung Association. 2025. Asthma -Friendly Schools Initiative Toolkit <https://www.lung.org/lung-health-diseases/lung-disease-lookup/asthma/health-professionals-educators/asthma-friendly-schools-initiative/toolkit>

American Lung Association. 2026. Indoor Air Quality in Schools. <https://www.lung.org/clean-air/indoor-air/building-type-air-resources/at-school>

American Lung Association. 2026. Cleaning Supplies and Household Chemicals. <https://www.lung.org/clean-air/indoor-air/indoor-air-pollutants/cleaning-supplies-household-chem>

Asthma and Allergy Foundation of America. 2026. Indoor Air Quality and Its Impact on School Children with Asthma. <https://community.aafa.org/blog/indoor-air-quality-and-its-impact-on-school-children-with-asthma>