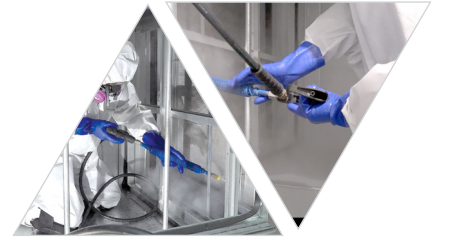


Indoor Air Quality

Answer Book for Schools



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FAQS

ABOUT INDOOR AIR QUALITY IN SCHOOLS

Americans spend 90% of their time indoors, and the average adult breathes around 3,000 gallons of air a day. Serious pollutants can cause allergic reactions, respiratory issues and other long-term health complications. Quite simply, the quality of the indoor air you breathe is critical for good health.

Ensuring the health and well-being of students and staff is a top priority for any school. Indoor air quality (IAQ) significantly influences the health and well-being of students and staff. Poor indoor air quality in schools can lead to respiratory issues and allergies and even affect cognitive function.

Here we answer questions about indoor air quality that can help school facility managers assess and identify issues, remediate problems and maintain optimal indoor air quality.



➔ What does the EPA say about indoor air quality?

The U.S. Environmental Protection Agency (EPA) stresses the importance of indoor air quality to maintain a healthy learning environment, reduce absenteeism, improve test scores and enhance student and staff productivity. A compilation of EPA resources and recommendations can be found at <https://www.epa.gov/iaq-schools>. Recommendations include regular maintenance of HVAC systems, proper ventilation, use of air purifiers, and monitoring of indoor pollutant levels. These measures collectively contribute to a healthier indoor environment. Deferring key maintenance activities to save costs risks unexpected and unbudgeted failures and repairs.

➔ How can I evaluate indoor air quality in my school facilities?

Look to Certified Indoor Air Quality Professionals (CIAQP), Certified Indoor Environmental Consultants (CIEC), Certified Mold Assessors/Remediators, Certified Air-Conditioning Contractors, Industrial Hygienists and Engineers who can work together with your facilities team to provide complete site assessments using state of the art protocols and technology.

➔ What is baseline IAQ testing?

Baseline indoor air quality testing refers to the initial assessment conducted to establish air quality within a building or indoor environment. It serves as a starting point to understand the levels of various pollutants, contaminants, or other factors affecting air quality. This testing typically involves measuring parameters such as:

- » Particulate Matter (PM): This includes dust, pollen, mold spores, and other tiny particles suspended in the air.
- » Volatile Organic Compounds (VOCs): These are chemicals emitted from various sources such as building materials, furnishings, cleaning products, etc.
- » Carbon Dioxide (CO₂): Levels of CO₂ can indicate indoor ventilation rates and the presence of occupants.
- » Carbon Monoxide (CO): A colorless, odorless gas produced by the incomplete combustion of fuels.
- » Relative Humidity (RH): The amount of moisture in the air, which can affect comfort and promote mold growth if too high.

Baseline testing provides a snapshot of the indoor environment's current state, which can be compared to future tests to assess any changes or improvements. It helps identify potential sources of indoor air quality issues and informs strategies for mitigation and improvement.

→ What's the best way to continuously monitor IAQ?

Continuous monitoring of indoor air quality involves using specialized devices equipped with sensors that measure various parameters in real-time. They may include:

- » **Air Quality Monitors:** These devices typically measure multiple parameters such as PM2.5 (fine particulate matter), VOCs, CO₂, temperature, and humidity. They provide real-time data and often come with accompanying mobile apps or online platforms for data visualization and analysis.
- » **Data Loggers:** Data loggers are compact devices that record environmental data over time. They can be equipped with sensors for specific pollutants or environmental conditions such as temperature, humidity, CO₂, or VOCs. Data loggers are useful for long-term monitoring and can be deployed in various indoor environments.
- » **Smart HVAC Systems:** Some modern HVAC (heating, ventilation, and air conditioning) systems are equipped with sensors to monitor indoor air quality parameters such as CO₂ levels and adjust ventilation rates accordingly. These systems can help maintain optimal indoor air quality levels while also improving energy efficiency.
- » **Internet of Things (IoT) Devices:** IoT devices can be integrated into building automation systems to monitor indoor air quality continuously. These devices can communicate with centralized control systems to automate responses based on predefined thresholds or triggers.
- » **Occupancy Sensors:** Occupancy sensors can detect the presence of occupants in indoor spaces and adjust ventilation rates accordingly. This helps ensure adequate ventilation when spaces are occupied, thereby improving indoor air quality.

Continuous monitoring provides valuable insights into indoor air quality trends, fluctuations, and potential issues. It enables proactive management strategies to maintain a healthy indoor environment and mitigate air quality-related problems.

→ How concerned should I be about mold?

Mold growth is a common concern that can negatively impact indoor air quality and, subsequently, the overall learning environment.

Mold is unsightly and poses potential health risks, especially to those with allergies, asthma, or compromised immune systems. According to the EPA, exposure to mold indoors can lead to respiratory issues, eye irritation and skin rashes, and exacerbate existing conditions. For students, prolonged exposure to moldy environments could hinder concentration, cause absenteeism, and affect academic performance.

It is important to address mold concerns in school buildings and HVAC systems to create a safe and healthy atmosphere.

→ What areas of school buildings are commonly prone to mold?

Certain areas within school buildings are more prone to mold growth due to high humidity levels, poor ventilation, and water leaks. These areas often include basements, bathrooms, locker rooms, and spaces with inadequate air circulation. Regular inspections and moisture control measures are essential to prevent mold from taking hold.

→ What can be done to prevent mold growth?

The HVAC system plays a crucial role in maintaining indoor air quality and preventing mold growth. Regular maintenance is key to ensuring that the system effectively controls humidity and circulates clean air. The following steps are recommended to address mold concerns in school buildings within HVAC systems:

- » **Regular Inspections:** Schedule routine inspections to identify any signs of mold growth or water damage within the HVAC system. Address these issues promptly to prevent further spread.
- » **Proper Ventilation:** Ensure that the HVAC system is properly designed to provide adequate ventilation to all areas of the school. Well-ventilated spaces are less likely to have moisture buildup that can lead to mold growth.
- » **Humidity Control:** Implement humidity control measures, such as using dehumidifiers in areas prone to excessive moisture. Keeping humidity levels between 30%–50% helps deter mold growth.
- » **Air Filters:** Regularly replace and clean air filters within the HVAC system to prevent the circulation of mold spores. High efficiency particulate air (HEPA) filters are recommended to capture smaller particles, including mold spores.
- » **Prompt Repairs:** Address any HVAC system malfunctions or leaks promptly to prevent water accumulation, which can lead to mold growth.

→ What role does HVAC play in indoor air quality?

HVAC systems play a pivotal role in maintaining good indoor air quality. Regular maintenance, including filter replacements and system cleaning, is essential to ensure that the HVAC system functions optimally. Proper ventilation, facilitated by well-maintained HVAC systems, helps in reducing the concentration of indoor pollutants.

→ What is an HVAC Conditions Assessment and what should it include?

An HVAC Conditions Assessment lets you know precisely how your HVAC system impacts your facilities' indoor air quality and bottom line. Over time, your HVAC system can become dirty, which can decrease its performance and degrade your facility's indoor air quality to the detriment of the occupants' health. The optimal approach to HVAC hygiene includes:

- » **Ventilation Strategies:** Effective ventilation is key to a healthy indoor environment. HVAC systems should be designed and operated to provide adequate outdoor air exchange. The EPA recommends ventilation rates based on the number of occupants and the size of the space, emphasizing the need for schools to adhere to these guidelines.
- » **Filtration and Air Cleaning:** High efficiency air filters, when regularly replaced, can significantly reduce the presence of airborne particles and allergens. Additionally, the use of air purifiers equipped with HEPA filters can provide an extra layer of protection, further contributing to improved indoor air quality.
- » **Monitoring and Management:** Regular monitoring of indoor air quality is essential to identify and address potential issues promptly. Many modern HVAC systems come with built-in monitoring capabilities, enabling facility managers to stay proactive in maintaining a healthy indoor environment. However, it's equally important to regularly assess the cleanliness and performance conditions of air handler units and ductwork.
- » **Reporting:** Once all the data is compiled and analyzed a detailed report outlines the conditions of the building in order to make remedial recommendations should indoor air quality issues be found.
- » **Adherence to the latest ASHRAE (American Society of Heating, Refrigeration and Air-Conditioning Engineers) guidance for the frequency of inspections and maintenance.** ASHRAE Standard 241 "Control of Infectious Aerosols" establishes the minimum requirements to reduce the risk of airborne disease transmission in buildings. This standard applies to both new and existing buildings. It provides requirements for HVAC system design, installation, operation, and maintenance.

→ Does the condition of the building envelope (roofs, walls, connections, doors, windows, etc.) impact indoor air quality?

Yes. The building envelope plays a crucial role in determining indoor air quality through its impact on ventilation, moisture control, and the ingress of outdoor pollutants. Considerations include:

- » **Ventilation:** The building envelope, which includes walls, windows, doors, roofs, and insulation, helps regulate airflow into and out of the building. Properly sealed and insulated envelopes facilitate controlled ventilation, allowing for the exchange of indoor and outdoor air. Inadequate sealing or insulation can lead to air leaks, compromising ventilation efficiency and potentially allowing outdoor pollutants to infiltrate indoor spaces.
- » **Moisture Control:** A well-maintained building envelope helps prevent moisture intrusion from rain, snow, or humidity. Moisture infiltration can lead to mold growth, which can degrade indoor air quality and pose health risks to occupants. Additionally, moisture accumulation within the building envelope can promote the release of volatile organic compounds (VOCs) from building materials and furnishings, further compromising indoor air quality.
- » **Pollutant Infiltration:** The condition of the building envelope affects its ability to prevent the infiltration of outdoor pollutants such as vehicle emissions, industrial pollutants, pollen, and dust. Gaps, cracks, or openings in the envelope can allow these pollutants to enter indoor spaces, contributing to poor indoor air quality.
- » **Energy Efficiency and Indoor Air Quality:** Building envelope improvements aimed at enhancing energy efficiency, such as air sealing and insulation upgrades, can inadvertently affect indoor air quality if not properly implemented. Tighter building envelopes can reduce natural ventilation rates, potentially leading to indoor air stagnation and pollutant buildup. Proper ventilation strategies, such as mechanical ventilation systems with heat recovery, can help mitigate this issue.

Proper design, construction, and maintenance of the building envelope are essential for maintaining a healthy indoor environment and maintaining energy-efficient facilities.

→ What is a “building health check?”

A building health check is an economical yet comprehensive evaluation of the indoor environment based upon HVAC zones. It combines field and laboratory analysis of the biological conditions and performance of a building.

Qualified building sciences and environmental diagnostics specialists conduct specific tests and complete photo documentation. Air and surface samples are collected and evaluated for bacteria, mold, and particulates. Temperature, relative humidity, and wall moisture are measured and logged.

The Building Health Check may include:

- » Mold Assessments
- » Contaminant Source & Risk Assessments
- » Infrared Thermography
- » Test & Balance Reporting
- » Allergen & Dust Screening
- » Wall & Floor Moisture Testing
- » Temperature & Humidity Logging

→ What indoor air quality best practices should schools implement?

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HVAC Inspection and Maintenance: Periodically perform a thorough inspection of the HVAC system. Ensure that:

- » All filters are cleaned or replaced. Dirty filters reduce airflow, leading to decreased indoor air quality and potential HVAC system malfunctions.
- » The ventilation system is inspected and cleaned of any debris or blockages that might hinder airflow.
- » HVAC ducts are checked for leaks and sealed appropriately to prevent air contamination.
- » Thermostats are calibrated accurately to maintain a comfortable temperature.
- » **IAQ Testing and Monitoring:** Install or utilize existing indoor air quality monitoring systems to keep track of air quality throughout the school year. Monitor and maintain records of key parameters, including:
 - » **Particulate Matter (PM) levels:** Dust, pollen, and other airborne particles can impact respiratory health.
 - » **Carbon Dioxide (CO₂) levels:** Proper ventilation is essential to prevent stuffiness and maintain alertness.
 - » **Volatile Organic Compounds (VOCs):** These can be released from various materials and affect air quality.
 - » **Temperature and humidity levels:** Ensure they are within the recommended ranges for comfort and health.

→ What indoor air quality best practices should schools implement?

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Ventilation Improvements: Enhance ventilation in classrooms and common areas to improve indoor air quality.

- » Consider installing air purifiers with HEPA filters to remove airborne pollutants and allergens.
- » Promote natural ventilation by opening windows and doors when outdoor air quality is acceptable.
- » Implement an HVAC schedule that allows for increased fresh air intake during non-peak hours.

Regular Custodial Cleaning and Maintenance: A clean environment is vital for good indoor air quality.

- » Regularly clean all surfaces, especially those prone to accumulating dust and dirt.
- » Keep carpets and rugs clean and vacuum with high-efficiency filters to reduce allergens.
- » Maintain cleanliness in storage rooms to prevent mold growth.
- » Regularly clean and sanitize restrooms and other high-traffic areas.

Mold Testing and Prevention: Mold can significantly affect indoor air quality and cause health issues.

- » Inspect and address any water leaks or water damage promptly to prevent mold growth.
- » Ensure proper ventilation in areas with high humidity, such as restrooms and kitchens.
- » Educate staff on identifying and reporting potential mold issues.

Green Spaces and Plants: Consider incorporating indoor plants into the school environment.

- » Some indoor plants can naturally improve indoor air quality by absorbing certain pollutants.
- » Ensure proper maintenance and watering to prevent mold growth in the soil.

Educating Staff and Students: Create awareness among staff and students about the importance of indoor air quality.

- » Educate everyone about the impact of a healthy indoor environment on academic performance and well-being.
- » Encourage staff and students to report any indoor air quality concerns promptly.

In Conclusion

Prioritizing indoor air quality in schools is not just a matter of compliance, it's an investment in the health and academic performance of students and staff. By following the EPA's recommendations and focusing on the role of HVAC systems, schools can create a learning environment that nurtures both physical well-being and educational success.

By taking a proactive approach, facility managers can ensure that their school buildings are well-prepared with optimal indoor air quality and a healthy and functioning HVAC system. A healthy and safe environment not only improves learning outcomes but also fosters a positive and enjoyable atmosphere for students and staff alike.

Prioritizing the health and well-being of students and staff involves taking proactive measures to address mold concerns in school buildings and HVAC systems and building envelope air leakage issues. By conducting regular inspections, maintaining proper ventilation, controlling humidity, sealing the building envelope, and educating the school community, you can create a safe environment that is conducive to learning for everyone.

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