



STATE OF ARIZONA SCHOOL FACILITIES BOARD

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Indoor Air Quality Information Updated July 1, 2014

According to the United States Environmental Protection Agency, indoor air quality (or IAQ) in schools is important because indoor air pollution can have significant and harmful health effects. It has been demonstrated that a positive link exists between airborne bacteria and other contaminants and asthma along with other health issues in children, which in turn increased absentee rates. According to the EPA's IAQ reference guide "Studies of human exposure to air pollutants indicate that indoor levels of pollutants may be two to five times – and occasionally more than 100 times – higher than outdoor levels. These levels of indoor air pollutants are of particular concern because most people spend about 90 percent of their time indoors." The American Lung Association found that U.S. students miss more than ten million school days each year because of asthma exacerbated by poor indoor air quality.

Susan Gerard, former Director of the Arizona Department of Health Services, wrote in the Arizona Asthma Coalition's Comprehensive Asthma Control Plan:

"Asthma is a major public health issue of growing concern in Arizona. Within the past decade statewide prevalence rates have continued to increase and are much higher than the national average. Asthma is one of our State's most common and costly diseases. More than 600,000 Arizonans suffer from asthma, of which 100,000 are children. Nationally, direct and indirect costs exceed \$14 billion annually.

The direct impact of asthma includes hospitalizations, emergency department visits, and deaths. The indirect effects of asthma reach well beyond asthmatics themselves and include missed school and workdays, and quality of life issues."

Some of the undesirable effects of poor indoor air quality cited by the EPA:

- Impacts student attendance, comfort, and performance.
- Reduces teacher and staff performance.
- Accelerates the deterioration and reduces the efficiency of a school's physical plant and equipment.
- Strains school administration, parent, and staff relationships and impacts community trust.
- Creates negative publicity.
- May create liability problems for a school district.

Why is IAQ Suddenly So Important?

School building construction practices were changed after the energy crisis of the 1970s in order to conserve energy. Buildings were more tightly sealed, ventilation rates were reduced to save energy. Also, the use of synthetic building materials and furnishings became prevalent, as did the greater use of chemically formulated school supplies such as dry erase marker pens,

white board cleaners, copy machine toners, art supplies, laboratory chemicals, pesticides, and janitorial products.

In addition, school district decisions such as delaying maintenance procedures or conducting insufficient maintenance in order to save money or reduce budgets sometimes lead to air quality problems. For example, moisture problems from roof and plumbing leaks, condensation, and excess humidity become more critical as these delays in repairs can grow into even larger problems.

Studies of indoor air contaminants demonstrate that children are more likely than adults to be adversely affected by poor indoor air quality. They breathe greater volumes of air relative to their body weights, which may lead to a greater effect of pollutants on their bodies. Children also are less likely than adults to recognize and communicate the symptoms they may be suffering.

Schools present some unique problems for managing indoor air quality, because students and teachers generally work more closely together in classrooms than people in office buildings. Also, schools have diverse activities through the day that may expose children to air pollutant sources from cafeterias, art and science classrooms, vocational education areas, restrooms and locker rooms.

Common Sources of Indoor Air Pollutants In Schools

- **Outdoor Air**

Poor indoor air quality can occur from natural materials such as pollen and dust, as well as from generated sources such as nearby industrial emissions, cars, buses, trucks, and lawn and garden equipment.

On-site sources can come from loading docks, dumpsters, and grease traps, particularly when they are located near building air intakes.

- **Moisture**

Moisture can be introduced into a building through structural leaks, plumbing leaks, flooding and heating, ventilating and air conditioning (HVAC) and related humidity problems. Moisture, in turn, may cause a degradation of indoor air quality.

- **HVAC Systems**

The purpose of the HVAC system is to filter air, heat and cool as required, and control humidity in the building. Many such systems introduce outside air into the process to dilute building contaminants, such as high carbon dioxide levels (CO₂) and volatile organic compounds (VOCs), which occupants contribute to a space such as a classroom. Poorly maintained HVAC equipment can allow water and bacteria growth to build up in drip pans, ductwork, coils and humidifiers, which can lead to a deterioration of indoor air quality, which could lead to Sick Building Syndrome (SBS).

Other sources come from improper venting of combustion products or dust and debris in ductwork.

- **Other School Equipment**

Emissions of poor quality air can come from office equipment such as copier toner and from shop, lab, cleaning equipment and air fresheners. Science lab supplies, vocational art supplies, dry-erase markers and similar wet pens can contribute to poor indoor air quality.

- **Plumbing**

Sink and floor drains have P-shaped traps that can cause IAQ problems in school buildings. If water in the trap evaporates due to infrequent use, any odor in the sewer, or even what someone in a nearby space has poured in the drain, can be dispersed in the building. Conversely, when liquids or solids are trapped in these bends and traps forming a seal, sewer gases cannot escape out of the drain as intended, causing poor indoor air quality.

- **Volatile Organic Compounds (VOCs)**

VOCs are byproducts emitted as gases from certain solids or liquids. Some common examples are paints, solvents, building materials (especially those manufactured with formaldehyde), aerosol sprays, adhesives, and emissions from new furnishings and floorings.

The EPA offers the following examples of formaldehyde products in everyday use: it is used to add permanent-press qualities to clothing and draperies, as a component of glues and adhesives, and as a preservative in some paints and coating products. Significant sources of formaldehyde are found in pressed wood products made using adhesives that contain urea-formaldehyde resins. Pressed wood products made for indoor use include a) particleboard, which is used as sub-flooring and shelving and in cabinetry and furniture; hardwood plywood paneling used in cabinets and furniture, and b) medium density fiberboard used for drawer fronts, cabinets, and furniture tops. Because medium density fiberboard contains a higher resin-to-wood ratio than any other UF pressed wood product, it is generally recognized as being the highest formaldehyde-emitting pressed wood product, although phenol-formaldehyde (PF), which is red/black in color, provides lower rate of VOCs.

Some VOCs cause eye, nose and throat irritation, headaches and nausea, and are suspected or known to cause cancer in humans.

- **Radon Gas**

Radon gas is a naturally occurring radioactive gas. It is harmlessly dispersed in outdoor air, but can be harmful when trapped in buildings. Radon generally enters buildings from soil and rock beneath and around building foundations and floor slabs. Due to the soil conditions across the southwestern United States, radon levels in Arizona generally occur at or below all code and regulatory levels.

- **Pesticides**

Chemical pesticides used to kill or control pests in and around schools can cause both indoor air quality problems and problems outside buildings when occupants either breathe in the chemicals or come into physical contact with them. The EPA states that one of its top priorities is to concentrate on reducing children's exposure to pesticides.

- **Dust**

Dust is difficult to control in schools because of the amount of children and adults moving in and out of the building, windows and doors that are opened frequently, and simply from moving air generated by school activities. Dust pollutants introduced into schools may include bacteria, pollen, dust mites, and animal dander. Dust mite allergens are known to cause an allergic reaction or trigger an asthma episode in sensitive individuals.

Preventative Maintenance Strategies for Managing Indoor Air Quality

1. Implement a comprehensive preventative maintenance program consistent with the School Facilities Board's Preventative Maintenance Program.
2. Conduct regularly scheduled building inspections, and measure the temperature and carbon dioxide levels in classrooms.
3. Regularly clean HVAC system air supply diffusers, return registers, and outside air intakes.
4. Regularly change filters and check that condensate pans are draining properly.
5. Maintain minimum outdoor air ventilation consistent with the most current standards of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE).
6. Correct water intrusion problems, including those from the roof, windows, and plumbing.
7. Adopt integrated pest management methods.
8. Use low volatile organic compound (VOC) paints, adhesives, and cleaning products.
9. Consider operating ventilation systems when custodial crews are cleaning.

Arizona Resources:

Arizona Department of Environmental Quality

Information on IAQ within High Performance School grant from EPA.

Stated goals are to:

- a. Provide high performance school design and operations information to school districts, architects, and school building officials through a variety of means.
- b. Work with schools to develop case studies on individual school's project implementation.
- c. Assist in developing statewide recommendations or guidelines for High Performance Schools.

<http://www.azdeq.gov/function/about/download/green.pdf>

Arizona Department of Education

Under Health & Nutrition Services: "Steps to a Healthier Arizona Initiative"

<http://www.azed.gov/health-nutrition/healthier-az/>

Arizona Administrative Code

Pesticide Management Areas; Criteria for Designation

[Arizona Administrative Code, R3-3-304](#)

Environmental Protection Agency

Indoor Air Quality – Tools for Schools Program

<http://www.epa.gov/iaq/schools/actionkit.html>