

Questions about indoor air quality

What is good IAQ?

Good indoor air quality includes:

- Proper temperature and humidity control
- Air free from odors, dust and other particulate matter, chemical pollutants and other contaminants
- Sufficient circulation to prevent stuffiness without causing drafts

What causes IAQ problems?

Indoor pollution sources that release gases or particles into the air are the primary cause of indoor air quality problems. These sources can include:

- Improper operation of HVAC or high volume copying equipment
- Cleaning materials and procedures
- Pollutants emitted during building or remodeling from substances such as
 - Adhesives
 - Paints and other coatings
 - Fabrics
 - Composite wood products

Human activities such as smoking, cooking and use of odorous cosmetic or air-treatment products can also impact indoor air quality.

Inadequate ventilation can increase indoor pollutant levels by not bringing in enough outdoor air to dilute emissions from indoor sources and by not carrying indoor air pollutants out of a building. High temperature and humidity levels can also increase concentrations of some pollutants.

How does ventilation affect IAQ?

If too little outdoor air circulates through a building, pollutants can accumulate to levels that can pose health and comfort problems.

Indoor air quality began to decline in the 1970's after the energy crisis of that era prompted the building of air-tight houses and office buildings. When exterior leaks, including spaces around doors and windows, began to be vigilantly sealed, interior air circulation was diminished. The introduction of fresh "makeup" air through air handling systems many times became reduced or even eliminated to save the cost of the

energy to heat or cool this fresh air. Pollutants are trapped in such tightly constructed buildings, becoming much more concentrated than they would be outdoors or in well-ventilated indoor spaces.

For healthy IAQ, it's important to balance a tight building with sufficient fresh air that is efficiently circulated by a well-maintained HVAC system.

How does outdoor air enter a building?

Outdoor air enters and leaves a building by: infiltration, natural ventilation, and mechanical ventilation.

In the process known as infiltration, outdoor air flows into a building through openings such as windows and doors, and through spaces like exterior joints and cracks around building openings.

In natural ventilation, air moves through a building when windows and doors are intentionally opened. Air movement associated with infiltration and natural ventilation is caused by air temperature differences between indoors and outdoors and by wind.

Finally, there are a number of mechanical ventilation devices, from outdoor-vented fans that intermittently remove air from a single room, such as bathrooms or a kitchen, to air handling systems that use fans and duct work to continuously remove indoor air and distribute filtered and conditioned outdoor air through a building.

The rate at which outdoor air replaces indoor air is described as the air exchange rate. When there is little infiltration, natural ventilation, or mechanical ventilation, the air exchange rate is low and pollutant levels can increase.

How does humidity affect IAQ?

Elevated relative humidity at a surface – 70 percent or higher – can lead to problems with mold, corrosion, decay and other moisture related deterioration. When relative humidity reaches 100 percent, condensation can occur on surfaces leading to a whole host of additional problems. An elevated relative humidity in carpet and within fabrics can lead to dust mite infestation and mildew (mildew is mold growing on fabrics).

Low relative humidity can lead to physical discomfort, shrinkage of wood floors and wood furniture, cracking of paint on wood trim and static electricity discharges.

Indoor humidification should be high enough to be comfortable, but low enough to avoid moisture problems associated with mold, corrosion, decay, and condensation.

Are some individuals at greater risk from indoor air pollution than others?

Yes, individuals who spend the longest periods of time indoors are often those most susceptible to the adverse effects of indoor air pollution. This at-risk population includes many people who work in office environments, especially those with chronic illnesses, such as respiratory or cardiovascular disease.

How does indoor air pollution affect your health?

Health effects can include irritation of the eyes, nose, and throat, headache, dizziness, fatigue, and allergy-type symptoms. Usually these symptoms are short-term, and disappear when the person is away from the source.

More serious symptoms such as asthma, hypersensitivity pneumonitis, and humidifier fever can also affect some individuals after exposure to certain indoor air pollutants.

There is a tremendous amount of variation in the sensitivity among individuals to indoor air pollutants. Some people may never experience any symptoms while others may truly suffer.

What are some of the major indoor air pollutants that might be found in an office building?

Typical pollutants include:

- Environmental Tobacco Smoke
- Biologicals – Bacteria, mold and mildew, viruses, animal dander, pollen, dust mites. These are more likely to be a problem in buildings with high humidity, or water-damage.
- Carbon Monoxide – From unvented gas appliances, leaking furnaces, vehicle exhaust entering windows or doors. Low levels can cause headaches, flu-like symptoms. High levels can be fatal.

- Respirable Particles – From construction, combustion of fuels, or substances tracked in from outdoors.
- Organic Gases – From products including paints and other coatings; paint strippers and other solvents; wood preservatives; aerosol sprays; cleansers and disinfectants; air fresheners; improperly stored or mixed janitorial or printing/copying chemicals; art supplies; dry-cleaned clothing.
- Formaldehyde – Used to manufacture pressed wood products (hardwood plywood paneling, particle board, fiberboard) and furniture made with pressed wood products; or urea-formaldehyde foam insulation.
- Pesticides – Used to kill insect or rodent pests, in building spaces or on indoor plants.

How can you identify the cause of an IAQ problem?

Because many symptoms brought on by an IAQ problem may be difficult to distinguish from viruses or allergies, care must be taken to identify details and patterns associated with an IAQ complaint.

For example, are symptoms worse while an affected individual is in a particular building space? Do they dissipate when a person is away for several days? What kinds of activities that could affect IAQ are taking place in the affected situation? Examples of such activities are smoking, cleaning, remodeling, or operation of construction, printing or cleaning equipment.

Detailed, accurate tracking of this kind of circumstantial data and analysis of observable patterns can sometimes help co-workers alleviate a problem with office IAQ. Collection of this kind of data can also significantly assist outside professionals, such as facility managers of multi-tenant buildings or environmental specialists, if a situation warrants calling in such resources to resolve suspected IAQ issues.

Sources: U.S. EPA, *The Inside Story: A Guide to Indoor Air Quality* (1995)

Texas Department of State Health Services, *Indoor Air Quality Program Branch* (2001)

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