

# INDOOR AIR QUALITY

What It Is and How to Address It, Part 1 of 3 June 17, 2008



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I was in a construction company office the other day and didn't know which was worse: the smell of the cigarettes or the smell of the chemicals. Both were horrible. "Oh, it's always like that," the secretary responded when I pointed out the odor. "It's just part of the construction industry." I was shocked. Nobody should have to breathe in cigarette smoke or chemical fumes. Of course, I realize I'm preaching to the choir here. As safety professionals, you understand the importance of indoor air quality (IAQ). But for the uninitiated, here's an overview on *why* it's important and what can be done by supervisors and employees to improve it.

## Why IAQ Is Important

Studies conducted by the U.S. Environmental Protection Agency (EPA) and others have found that the level of pollutants of air in indoor environments is actually higher than the levels of the air outside. These pollutants increase the risk of illness.

Since most Americans spend up to 90% of their time indoors, indoor air quality is a major concern for employers because of its effects on the health and productivity of employees. In fact, the EPA estimates that poor IAQ may cost the nation tens of billions of dollars each year in lost productivity and medical care and, in their 1989 Report to Congress, concluded that improved indoor air quality can result in fewer lost work days and higher productivity.

## Factors that Contribute to IAQ

While most buildings don't have severe IAQ problems, even well run buildings can sometimes experience episodes of poor IAQ.

But what exactly is indoor air quality? It's not a simple, easily defined problem like a wobbly desk or a leaky faucet. IAQ is a constantly changing interaction of complex factors that affect the types, levels and importance of pollutants in indoor environments. These factors include:

- Sources of pollutants or odors;
- Design, maintenance and operation of building ventilation systems;
- Moisture and humidity;
- Occupant perceptions; and
- Susceptibilities, etc.

There are many other factors that affect comfort or perception of indoor air quality.

### **3 Key Pollutants**

Three of the key pollutant categories include:

**1. Biological Contaminants:** Excessive concentrations of bacteria, viruses, fungi (including molds), dust mite allergens, animal dander and pollen may result from inadequate maintenance and housekeeping, water spills, inadequate humidity control and condensation, or may be brought into the building by occupants, infiltration or ventilation air. Indoor biological pollutant exposures can cause symptoms in allergic individuals and also play a key role in triggering asthma episodes for an estimated 15 million Americans.

**2. Chemical Pollutants:** Sources of chemical pollutants include tobacco smoke, emissions from products used in the building (e.g., office equipment and furniture, wall and floor coverings, and cleaning and consumer products), accidental spill of chemicals and gases such as carbon monoxide and nitrogen dioxide.

**3. Particles:** Particles are solid or liquid substances that are light enough to be suspended in the air, the largest of which may be visible in sunbeams streaming into a room. However, smaller particles that you cannot see are likely to be more harmful to health. Particles of dust, dirt or other substances may be drawn into the building from outside and can also be produced by activities that occur in buildings, like sanding wood or drywall, printing, copying, operating equipment and smoking.

### **Effects of Pollutants**

Many different factors influence how indoor air pollutants impact occupants. Some pollutants, such as radon, are of concern because exposure to high levels of the pollutant over long periods of time increases risk of serious, life threatening illnesses, such as lung cancer. Other contaminants, such as carbon monoxide at very high levels, can cause death within minutes. And some pollutants can cause both short and long term health problems. For example, prolonged exposure to environmental tobacco smoke can cause lung cancer and short term exposures can result in irritation and significant respiratory problems for some people, particularly young children.

It's also important to note that people can react very differently when exposed to the same contaminants at similar concentrations. For example, some people can develop severe allergic reactions to biological contaminants to which other people will not react. Similarly, exposure to very low levels of chemicals may be irritating to some people but not others. For people with asthma and other pre-existing conditions, exposure to irritants like environmental tobacco smoke or gases or particles from various indoor sources may cause more severe reactions than the same exposure would in other people.

### **Conclusion**

Now that we've cleared up the definitions, identified some key pollutants and listed the possible effects on employees, next week we'll look at seven important components of your key defense against poor IAQ: your HVAC system.

## **INDOOR AIR QUALITY**

### **You and Your HVAC System, Part 2 of 3 July 8, 2008**

In Part 1 of this series, we looked at how key pollutants may be affecting the quality of air in your workplace and how poor indoor air quality (IAQ) affects the health of your employees. This week, let's take a look at one of the most important systems available to you to manage IAQ: the heating, ventilation and air conditioning (HVAC) system.

#### **Design, Maintenance & Operation of Ventilation Systems**

HVAC systems include all of the equipment used to ventilate, heat and cool the building, to move the air around the building (ductwork), and to filter and clean the air. These systems can have a significant impact on how pollutants are distributed and removed. Maintaining good indoor air quality requires attention to the building's HVAC system.

The system's ability to perform properly can be affected by increased numbers of occupants and additional or relocated heat sources (such as computers or other equipment). In some cases, HVAC systems can even act as sources of pollutants, such as when ventilation air filters become contaminated with dirt and/or moisture and when microbial growth results from stagnant water in drip pans or from uncontrolled moisture inside of air ducts.

Because of the HVAC system's importance, good IAQ management includes paying attention to these seven features:

#### **1. Ventilation System Design**

The air delivery capacity of an HVAC system is based in part on the projected number of people and amount of equipment in a building. When areas in a building are used differently from their original purpose, the HVAC system may require modification to accommodate these changes. For example, if a storage area is converted into space occupied by people, the HVAC system may require alteration to deliver enough conditioned air to the space.

#### **2. Outside Air Supply**

Adequate supply of outside air, typically delivered through the HVAC system, is necessary in any office environment to dilute pollutants that are released by equipment, building materials, furnishings, products and people. Effective distribution of ventilation air to occupied spaces is also essential for comfort.

#### **3. Outdoor Air Quality**

When present, outdoor air pollutants, such as carbon monoxide, pollen and dust may affect indoor conditions when outside air is taken into a building's ventilation system. Properly installed and maintained filters can trap many of the particles in this outdoor supply air. Controlling gaseous or chemical pollutants may require more specialized filtration equipment.

#### **4. Space Planning**

The use and placement of furniture and equipment may affect the delivery of air to an occupied space. For instance, the placement of heat generating equipment, like a computer, directly under an HVAC control device, such as a thermostat, may cause the HVAC system to deliver too much cool air, because the thermostat senses that the area is too warm. Furniture or partitions that block supply or return air registers can affect IAQ as well, and need to be positioned with attention to air flow.

#### **5. Equipment Maintenance**

Diligent maintenance of HVAC equipment is essential for the adequate delivery and quality of building air. All well-run buildings have preventive maintenance programs that help ensure the proper functioning of HVAC systems.

#### **6. Controlling Other Pollutant Pathways**

Pollutants can spread throughout a building by moving through stairwells, elevator shafts, wall spaces and utility chases. Special ventilation or other control measures may be needed for some sources.

#### **7. Moisture & Humidity**

It is important to control moisture and relative humidity in occupied spaces. The presence of moisture and dirt can cause molds and other biological contaminants to thrive. Relative humidity levels that are too high can contribute to the growth and spread of unhealthy biological pollutants, as can failure to dry water-damaged materials promptly (usually within 24 hours) or to properly maintain equipment with water reservoirs or drain pans (e.g., humidifiers, refrigerators and ventilation equipment). Humidity levels that are too low, however, may contribute to irritated mucous membranes, dry eyes and sinus **discomfort.**

#### **Conclusion**

Maintaining a good HVAC system is just a start. There are a few other ways that you and your employees can improve the indoor air quality in your workplace. We'll discuss these in the conclusion of our series next week.

## **INDOOR AIR QUALITY**

### **Sharing Responsibility for Indoor Air Quality, Part 3 of 3 July 15, 2008**

Problems with the HVAC system can lead to poor indoor air quality (IAQ). Sometimes the problems stem from inadequate HVAC design. Sometimes it's due to factors, such as maintenance of the HVAC system and the amount of outside air being mechanically brought into the building, that are solely in the control of building management. In other cases, it might be the people who are largely in the control of or who occupy the building that cause the problems, such as through the materials they use in renovations or the products and furnishings they use or bring into the building.

And in still other situations, the problems come from both building management and the individuals who work in the building such as via inadequate cleanliness and housekeeping. The bottom line: IAQ is a shared responsibility.

#### **When IAQ Is Beyond the Realm of the HVAC System**

Good indoor air quality management practices can be very effective in controlling IAQ problems. However, some factors, such as reactions to indoor air contaminants among highly susceptible individuals or the quality of the outside air, may not be within anyone's immediate control. Any building, no matter how well operated, may experience periods of unacceptable IAQ due to equipment breakdown, accidents, or in some cases, the actions of building occupants.

It's also important to keep in mind that many perceived IAQ problems are often comfort problems, such as temperature, humidity or air movement in the space being too low or too high. Remember, too, that many symptoms, such as headaches, can have causes that are not related to factors in the building.

There are a number of environmental and personal factors that can affect both how people perceive air quality and the levels of pollutants. These are:

- Odors;
- Temperature - too hot or cold air velocity and movement, too drafty or stuffy;
- Heat or glare from sunlight;
- Glare from ceiling lights, especially on monitor screens;
- Furniture crowding;
- Stress in the workplace or home;
- Feelings about physical aspects of the workplace, such as location, work environment, availability of natural light and the aesthetics of office design, such as color and style;
- Work space ergonomics, including height and location of computer, and adjustability of keyboards and desk chairs;
- Noise and vibration levels; and
- Selection, location and use of office equipment.

## **IAQ Management Strategies for Employees and Supervisors**

Let's look at a few things that employers and employees can do to improve the quality of air in the workplace.

### **For Employees:**

1. Do not block air vents or grilles.
2. Comply with the office and building smoking policy.
3. Water and maintain office plants properly.
4. Dispose of garbage promptly.
5. Store food properly.
6. Avoid bringing products into the building that could release harmful or bothersome odors or contaminants.
7. Notify your supervisor or office manager immediately if you suspect an IAQ problem.

### **For Supervisors:**

1. When placing office furniture and equipment, bear in mind the air circulation, temperature control and pollutant removal functions of the heating, ventilating and air conditioning (HVAC) system.
2. Coordinate with building management in instances when responsibility for design, operation and maintenance of the ventilation system is shared.
3. Establish an effective smoking policy that protects nonsmokers from involuntary exposure to secondhand smoke.
4. Avoid procedures and products that can cause IAQ problems.
5. Integrate IAQ concerns into your purchasing decisions.
6. Work with the building manager to ensure use of only necessary and appropriate pest control practices, using non-chemical methods where possible.
7. Work with building management and the contractor before you remodel or renovate to identify ways of keeping building occupant exposure to pollutants to a minimum and to ensure that the air distribution system is not disrupted.

### **Conclusion**

Good indoor air quality depends on the actions of everyone in the building, so whether your building is occupied entirely by your organization or you lease space with other tenants, a partnership between building management and all occupants, including employees, is the best way to maintain a productive - and healthy - workspace.

