



Indoor Air Quality

Indoor air pollution is a major public health problem that threatens virtually all workers in offices and buildings. Contaminated indoor air occurs when toxic substances combine with inadequate building ventilation, causing health problems such as eye, nose and throat irritation; sinus discomfort; headaches; sneezing and coughing; respiratory infections; and fatigue.

What Are the Sources?

Poor indoor air quality can be traced to many sources, including office equipment, furniture, carpeting, and construction materials. In addition, buildings are often designed or renovated without attention to ventilation, resulting in sealed windows, blocked vents and a general lack of fresh air.

Office Equipment

Electrical equipment such as photocopiers may give off ozone, which irritates the eyes and the respiratory tract, causes headaches, and has been shown to cause adverse genetic effects. Ink toner in photocopying machines use many dangerous substances including methyl alcohol, a solvent which can dry the skin, irritate the eyes, nose and throat and cause dizziness or even blindness.

Many common office supplies are also dangerous, releasing vapors and dusts that can cause a variety of skin and respiratory problems. These include glue, rubber cement, inks, carbon paper, carbonless paper, typewriter ribbon, and correction fluid.

Renovation and New Furnishings

A variety of solvents are used in roofing, painting and renovation work and they can cause skin dryness, respiratory irritation, and with greater exposure, dizziness or nausea.

Formaldehyde one of the most common pollutants in office buildings, is found in furniture, new carpets, particle board, plywood, and many other products. As it deteriorates, formaldehyde gives off fumes which - even at low levels - can cause irritation of the eyes and respiratory system. Recent studies show that prolonged exposure may also cause cancer.

Custodial and Maintenance Work

Chemicals such as ammonia, solvents, paint strippers and cleansers are widely used by custodians and maintenance workers in the course of their jobs. Many of these substances can lead to respiratory irritation, chronic lung disease, and eye irritation. Making matters worse, these chemicals can easily spread through the ventilation system, putting everyone in the area at risk.

Two particularly dangerous groups of chemicals are

insecticides and pesticides. These highly toxic substances can remain in the air long after being sprayed. They are known to cause cancer and birth defects and they also irritate the skin, eyes and lungs.

Biological Agents

Biological agents include bacteria, viruses, fungi, pollen, dust mites and other insects, animal dander (tiny scales from hair, feathers, or skin) and molds. They can travel through the air and are often invisible. They are usually inhaled, either alone or by attaching themselves to particles of dust and then entering the respiratory system. Two conditions are essential to support biological growth--nutrients and moisture.

Bacteria, fungi and molds find nourishment and can flourish in improperly maintained air ducts, air conditioners, humidifiers, air-cleaning filters, carpets and in improperly ventilated places where moisture is likely to collect, such as bathrooms, kitchens, laundry rooms and basements. Viruses can be carried indoors by people, while plants, pets and insects are potential sources of pollen, dander, and other allergies. Dust mites and other insects can thrive in sofas, stuffed chairs, carpets and bedding.

When biological agents are allowed to flourish in poorly maintained ventilation systems, severe health problems can result that can be experienced throughout an entire building. Infectious and noninfectious diseases can be caused by the various biological agents. They can make you sneeze, trigger allergic reactions, cause rashes, watery eyes, hoarseness, coughing, dizziness, lethargy, breathing problems, and digestive problems.

People with asthma are especially susceptible to allergic problems caused by biological agents.

Exhaust and Cigarette Smoke

Diesel exhaust, containing carbon dioxide and cancer-causing substances, can enter buildings through improperly located air-intake vents or from loading docks. Carbon dioxide causes headaches, dizziness and nausea, and can be traced to many sources, including boiler gas and cigarette smoke.

The outside environment may be another source of indoor air pollution, particularly if toxic vapors or gases from neighboring industrial plants or garbage dumps enter the ventilation system.

Ventilation Systems

To eliminate indoor air pollution, there must be a good source of fresh air as well as sufficient air movement. Unfortunately, ventilation in both new and old buildings is frequently inadequate. Most older buildings do not have a mechanical ventilation system. While some fresh air may enter through doors, windows and cracks, it is often not enough. And during winter months or when energy conservation measures are implemented, fresh air may be cut off entirely.

New buildings with sealed windows present their own air quality problems, relying solely on mechanical ventilation systems to bring outdoor air into the building and move it to all areas. When the system fails because of contamination, blockage or other problems, air quality may suffer dramatically. To save energy, some buildings use ventilation systems which recirculate air that has already been heated

Evaluating Your Ventilation System

Does your workplace have a ventilation system?

This is not as odd a question as it may seem. Some buildings do not have ventilating systems. You can check to see if yours does by walking around and looking for vents and ducts.

Is the system on all the time?

Often, the air circulation in a building will stop at 5 P.M. or on weekends even though people may regularly work late or night shifts. In many offices, large duplicating and printing jobs are done at night, and machines can produce a high volume of pollutants.

You can test whether the system is on by holding a tissue near the vent. If it moves, air is being circulated. Do this before and after 5 P.M.

Is the system continuous or does it go on and off during the day?

Some ventilation systems are on a time cycle. This means that the blower will turn on and off at regular intervals throughout the day. If your workplace is constantly generating air pollutants, such a system may not be giving you enough fresh air. The pollutants may accumulate while the system is off. Check the airflow regularly during the day to find out if you are getting fresh air continuously.

Does each room have a vent?

Walk around and make a listing of the number of vents per room. Make sure you look on the walls and floors--and remember, no vents, no air.

Are the vents supplying or removing air?

In each room there should always be a supply and an exhaust vent. This type of ventilation system is called dilution ventilation. You can determine which vents are bringing air in and which are removing it by holding a tissue at the face of the vent. If air is moving past, you will be able to see it.

Are the vents for supply and exhaust right next to each other?

When supply and exhaust vents are too close, the clean,

or cooled. The air is passed through a filter, and sent back out through the building. But the percentage of fresh air can be as low as 5-10% and in the recirculated air, germs and chemical contaminants multiply, significantly raising the risk of both irritation and infection.

To remove fumes and dust from a specific operation, a local exhaust system is used. Examples are the dust control system in a wood shop or ventilation hoods in the chemistry lab. But these systems may create as many problems as they solve. They may be weak, allowing pollutants to escape into the general air supply, or they may pull toxic vapors through an area where people breathe.

Every general ventilation system consists of one or more blowers which move the air, ducts which carry the air from one place to another, and vents which distribute it. The vents may be either supplying air or removing (exhausting) it.

fresh air gets sucked out of the room before it has adequately circulated. This is called short-circuiting. It is the result of poor engineering design, and is difficult to repair.

Are the vents blocked in any way?

Exhaust and supply vents will work only if the air can move freely around them. Blockage by walls, partitions, or even piled up boxes or files, will obstruct the air flow and reduce the ventilation efficiency.

Are there any dead spaces in your office?

Dead spaces are those in which no air is replaced and in which pollutants will therefore build up. You can check to see if there are any in your workplace office by lighting a match and noticing how the smoke moves. (Caution - be certain that an open flame is allowed in your workplace and does not present a safety hazard.) Inexpensive smoke tubes are also available for this purpose.

Does the smoke flow toward an exhaust vent or simply stay in one place?

If it doesn't move, pollutants too will remain in the air; they are not being exhausted. The principal reason for dead spaces is poor placement of supply and exhaust vents.

Do office areas with printing and copying machines have adequate air supply and exhaust?

You can find out by counting the vents, determining which way the air is moving and looking for dead spaces. For some machines, general ventilation is insufficient. You will need extra vents near the source of the fumes emitted.

Do you have control over your vent system?

Some offices make it possible for workers to have control over the ventilation. You may be able to enter the fan room and to turn the blower or fan supplying the air up or down. Check with your building maintenance office to see if you can do this.

Is there a smoke detector in your ventilation system?

There should be one. It is essential for early signaling of a fire. The detector should be located in the duct taking the air out of the office.

Are the temperature and humidity adequate?

The importance of a comfortable temperature is obvious. But comfort also means proper humidity, or water in the air. When the office air is too dry your nasal passages dry up.

Indoor Air Pollution Measurements

In order to determine just how good or bad is the air in your office, you will have to test it. You may test for

- the amount of air flow
- the amount and types of air pollutants
- the amount of heat and moisture.

Some of these measurements are easily determined while others require specialized equipment.

For flow measurements you will need an airflow meter, also called a velometer. These are not very expensive and are usually able to measure both air coming into a room from the supply vent and air going out through the exhaust vent.

Smoke tubes, which are available in hardware stores, can also be used. But these will tell you only where the air is going and not how much air is being moved.

The readings from a velometer are in cubic feet per minute of air. The numbers should be:

Air conditioned space: 50-75.

Fixed work station, general ventilation or spot cooling:
sitting: 75-125; standing: 100-200

Intermittent exposure, spot cooling or relief stations:
Light heat loads and activity: 1000-2000
Moderate heat loads and activity: 2000-3000
High heat loads and activity: 3000-4000

Your local health department will usually set required minimum ventilation standards for office buildings, but these standards vary from state to state. Check with your state, county or city health department to see how your workplace measures up to the health code, and if there is a violation.

Measurement of specific air pollutants usually requires very specialized instruments which may be difficult to obtain. However, some pollutants you may want to look for, even

You may get headaches and become more susceptible to colds, flu, and other infections. When the air is too humid you also feel uncomfortable. Humidity makes a cold room feel colder and a hot room feel hotter.

without exact measurements, are the following:

Carbon monoxide--from cigarettes, gas heaters or any cooking or burning. This is a chemical asphyxiant which robs your body of needed oxygen and can cause headaches, nausea and dizziness.

Carbon dioxide--from insufficient air exchange. This can also cause headaches, nausea, and dizziness.

Ozone--from any machine that produces an electric spark, such as a duplicating machine. This can be a respiratory irritant.

Smoke and dusts--from powders, burning substances, cigarettes. These can cause eye and throat irritation, coughing and, if particularly heavy, lung disease.

Microbes (bacteria, fungi and viruses)--from cooling water used in the ventilation system. These can cause colds, influenza and such infectious diseases as Legionnaires Disease.

Oxides of nitrogen--from high temperature machines, hot plates, cooking gas. These can cause watery eyes and irritations of the respiratory system.

Miscellaneous chemicals--such as solvents from glues, paints and other office supplies, or chemicals used in duplicating machines, such as toners, dyes and developers.

Measurements for temperature and moisture are easily made. Temperature can be determined by any common thermometer, but be sure that checks are made on such places as exhaust vents, supply vents, halls and dead spaces.

Moisture can be measured by a hydrometer, with the readings in percent relative humidity. The higher the number, the more water is in the air and, usually, the more discomfort there will be. But, as noted above, too low a moisture reading can also be bad.

How Can Indoor Air Pollution Problems Be Solved?

What you can push management to do:

- Increase air supply. Clean and maintain the ventilation system and open or unblock all sources of fresh air.
- Eliminate sources of contamination. Substitute less dangerous chemicals, such as water-based paints, for more toxic substances, such as oil paints.
- Clean and dry damp areas or places where bacteria

or fungi can grow.

- Isolate machines that release toxic fumes, such as photocopier.
- Make sure hazardous work is done only on the weekends, and inform the union before it begins.
- Ensure that people who work with hazardous chemicals are protected with adequate ventilation or protective equipment, such as respirators.
- Provide information about all chemicals in use, as required by the New York State Right-to-Know Law and the Occupational Safety and Health

Administration's Hazard Communication Standard.

- Maintain temperature within the comfort zone of 65 to 75 degrees Fahrenheit and humidity within a relative humidity of 30 - 60%.
- Ensure that all local exhaust systems pull polluted vapors away from people's breathing area and that local systems do not compete with the primary ventilation system.
- Bring in a ventilation engineer to ensure that air movement is sufficient and to recommend remedies for any problem areas. This investigation can determine if you meet the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) indoor air quality standards, which recommend 20 cubic feet per minute (cfm) of fresh air per person in offices. A simple tool called a velometer is used to take these measurements.
- Carry out any changes and improvements recommended by the ventilation engineer.

What your union can do:

- Develop a health and safety committee to work to correct indoor air, and other, problems.
- Conduct a health survey of the members, looking for problems typical of indoor air pollution and check to see if symptoms are linked to the job.
- Investigate your building's ventilation system. Find out what type of ventilation system, if any, is used. (To check the effectiveness of a ventilation system, hold tissue paper near the vents to see if they're working - there should be both a supply and exhaust vent in each room. Also check for problems with local exhaust systems.)

- Develop recommendations and priorities for improving air quality.
- Write contract language that will protect your rights to clean air. Your union representative can suggest sample language and you may also want to use the ASHRAE standard as a guide.
- Consider filing a complaint with the New York State Department of Labor's Division of Safety and Health or OSHA if you have a well-documented problem and you are not making any progress with management. You may also want to file a request for a Health Hazard Evaluation conducted by the National Institute for Occupational Safety and Health. According to law, employers must provide safe, healthful workplaces that are free of hazards, including indoor air pollution. (always work with your union representative when filing a complaint. But don't stop working! Complaints to the Department of Labor, OSHA or DOSH are no substitute for consistent union action.)
- Find out about legislative activity - and get involved. While there is no federal or New York State regulation on indoor air pollution, legislation has been proposed and several other states have enacted indoor air pollution laws.

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**For more information,
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