

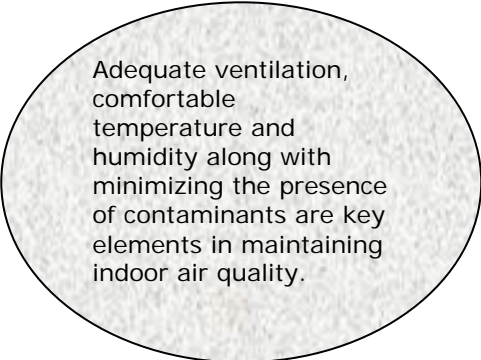
# Indoor Air Quality **FACT** Sheet

## Health & Safety Fact Sheet on Factors Affecting Indoor Air Quality

The Ottawa Hospital (TOH) is committed to providing and maintaining a safe and healthy work environment for all employees. This includes the provision of comfortable working conditions.

**Indoor Air Quality (IAQ):** the characteristics of the indoor climate of a building, including the gaseous composition, temperature, relative humidity, and airborne contaminant levels. It is the product of the interaction between:

- the site (building and workspace)
- the indoor climate
- the building heating ventilation and air conditioning (HVAC) system(s)
- potential sources of contamination such as particulate (either liquid or solid), gases, or vapours
- outdoor pollutants
- work processes and activities
- building occupants



Adequate ventilation, comfortable temperature and humidity along with minimizing the presence of contaminants are key elements in maintaining indoor air quality.

The **HVAC** system is designed to provide thermal comfort (temperature and humidity), distribute outdoor air (ventilation) to occupants, remove odours and contaminants through the use of exhaust fans or dilute them to acceptable levels, and control pressure relationships (airflow) between rooms. In addition the number of air changes per hour and the efficiency of the filtration system are regulated by health care facility standards. The IAQ of any building is evaluated according to regulations and guidelines set by the federal and provincial governments.

### Factors Affecting Indoor Air Quality

**Airborne particulates or chemicals** (gases or vapours, odours) can have a negative impact on indoor air quality. Particulate contaminants include dust, fungal or mould spores, viruses, bacteria, animal dander and droppings, and insect droppings and fragments. Some common indoor **chemical contaminants** are formaldehyde, carbon dioxide, and vapours or gases from products (liquid, solid or gas) being handled and stored.

**Sources of contamination** can originate in the environment **outside or inside** the building. Outdoor sources include vehicle exhaust from roadways and loading docks, odours from trash compactors, dust and debris due to construction activities, and pollen and mould spores. These contaminants can enter the building through the air intakes, or through windows and doorways.

Many different species of fungal (mould) spores found indoors are common in the outdoor environment and originate from plants, trees, water and soil. Mould growth due to water damage, whether visible or hidden, is not acceptable and requires remediation.

**Indoor sources** of mould contamination can include mould growth on wet materials, such as drywall, ceiling tiles, carpeting, paper products, or stagnant water. Mould growth can be reduced by regular maintenance of the HVAC systems and maintaining humidity levels within the recommended guidelines. When water damage occurs it is important to perform appropriate water damage restoration, however, often porous materials (those which can absorb water) may have to be replaced.

Other indoor sources of contamination are:

- dust and debris from renovation and construction
- poor housekeeping practices
- uninvited guests (insects & mice)
- the occupants themselves (bacteria, viruses, smoke, fragrance)
- the storage and handling of chemicals (solvents, laboratory agents such as acids and bases)
- work processes such as handling large amounts of paper
- cleaning and maintenance activities (disinfectants, floor waxes, degreasers)

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More than 1000 different products emit **Volatile Organic Compounds** (VOC's). These are gaseous contaminants from liquid and solid products, many of which are used and handled in the workplace and the home. Paints, varnishes, waxes, fuels, spray cans, pesticides, cleaning / degreasing products and building materials all release, to some extent, VOC's. For example, new materials such as furniture, carpeting, flooring and plastics can off-gas VOC's such as **formaldehyde**, which can negatively affect air quality.

**Carbon monoxide** can result from vehicle exhaust entering the building through the fresh air intakes, or from vehicles idling close to the building. Sources of carbon monoxide also include combustion (burning) and tobacco smoke. Likewise decaying organic materials such as leaves, bird droppings, or stagnant pools of water as well as cigarette smoke, kitchen exhaust, or garbage can produce **objectionable odours** that can also enter the building through fresh air intakes.

**Carbon dioxide** (CO<sub>2</sub>) is the natural by-product of respiration and is a good indicator of the general effectiveness of the ventilation system. *The American Society of Heating Ventilation and Air Conditioning Engineers (ASHRAE)* recommends a general comfort level of **1000 parts per million (ppm) or less** for carbon dioxide. The regulated safe acceptable level recommended under the Ontario Occupational Health & Safety Act (OH&SA) is 5000 ppm for an 8-hour time frame. When CO<sub>2</sub> levels are elevated, occupants may report *stale* or *stuffy* air, lethargy, headaches, and drowsiness.

Individual preferences for **temperature** vary widely according personal health, age, gender, and the type of work activity (very physical vs. desk-bound work). *ASHRAE* identifies the thermal comfort level; the temperature range at which 80% of occupants will be comfortable. During the heating season, the range is **20°C to 25.5°C** and during the cooling season it is **23°C to 28°C**.

**Relative humidity** (RH) is the amount of moisture present in the air. RH levels tend to be higher in the warm months, and lower during the colder months. RH levels below 25% can result in dry skin and eyes and nose and throat irritation which can be linked to higher incidences of respiratory illnesses. If RH levels are too high, the air may condense on cool surfaces increasing the risk for mould growth. *ASHRAE* recommends a comfort level for relative humidity of 30 - 60%

Indoor Air Quality should be investigated if you experience symptoms (e.g. dryness and irritation of the nose, throat and skin, headaches, fatigue, coughing and sneezing, dizziness or nausea) within a few hours of beginning work and the symptoms lessen or disappear after leaving the building.

Investigating indoor air quality concerns is a complex process - a wide range of factors are considered but the process begins with a visual inspection of the work area, looking for clues such as moisture problems, the presence of mould, the use of chemicals, the cleanliness of the workspace, any unusual odours, as well as physical and ergonomic factors (workspace layout, noise, functionality of workstation, lighting, etc.). Psychosocial factors may also be considered part of the investigation because stress and the morale of occupants can also influence an individual's perception of indoor air quality.

For general concerns about workspace temperature or humidity, to report leaks, water damage, or visible mould, advise your supervisor / manager to contact **Facilities at 14281** (all campuses)

If you experience adverse health effects that you believe could be related to your work environment, inform your supervisor / manager, and complete an *Employee Incident Report*.

TOH Resources:        *Mould Remediation Fact Sheet*  
ADM VI 360 Scent-Free Workplace  
ADM VI 310 Reporting Workplace Incidents  
ADM V 230 Mould Remediation

Other Resources:     American Society of Heating Ventilation and Air Conditioning Engineers Standard 55-2004, Thermal Environmental Conditions for Human Comfort  
Canadian Standards Association Z204-94