

Indoor Air Quality Management Program

Indoor Air Quality (IAQ)

Indoor air quality is an important focus of occupational health and safety at the University of Manitoba. The University operates a series of programs and procedures to manage indoor air quality from construction through to operations. Responsibilities of air quality management are spread amongst a variety of roles across the University's operations and therefore require diverse procedures depending on the project and building type, age, and use.

Indoor Air Contaminants

Causes of IAQ Problems

- Airtight buildings that reduce energy consumption by heating and cooling (HVAC) systems
- Reduced intake of outside air
- Climate
- Indoor environment – inadequate temperature, humidity, lighting, excessive noise
- Indoor air contaminants – chemicals (construction materials and furnishings, glues, fiberglass, particle boards, stored chemicals and storage practices etc.), dusts, moulds, microbial contamination, gases, vapours, odours.
- Activities within the building
- Increase in the number of building occupants and time spent indoors
- Increased awareness of potential IAQ problems

Common Indoor Air Contaminants and Their Main Sources

- Carbon dioxide, tobacco smoke, perfume from building occupants and kitchen fumes (if there is one)
- Dust, fiberglass, asbestos, gas from building materials
- Toxic vapours, volatile organic compounds (VOCs including formaldehyde) – from cleansers, pesticides, disinfectants, glues or from stored chemicals
- Gases, vapours, odours from furniture, carpets and paints
- Fungi, bacteria, microbials, mites from damp area, stagnant waters and condensates
- Ozone – from photocopiers, electric motors, electrostatic cleaners

Procedural Exposure Controls

By the [Manitoba Workplace Safety and Health Act and Regulation](#) (2016), an employer must ensure that a workplace has appropriate air quality, is adequately ventilated, and contaminants and impurities are prevented from accumulating in the air. If work is being conducted that will create chemical or biological

airborne hazards, it is required that control measures be in place to not exceed the occupational exposure limit for the material being used.

General Protocol

See: http://umanitoba.ca/campus/health_and_safety/chemsafety/IAQ.pdf

The maintenance desk at the University's Physical Plant works with the control departments to check systems, filters, and other mechanisms when complaints or notices are received. If a concern cannot be addressed by Physical Plant, or an occupant is complaining about a health related issue, EH&S is engaged. EH&S may also be contacted directly by occupants with health related and air quality concerns.

When a call is received, an informal walk through of the area and a check with the people concerned is conducted. Temperature, relative humidity and concentration of carbon dioxide as well as particulates are measured. The instruments measure ultrafine particles and relative readings compared to outside and gives an indication of the efficiency of the filters in operation in the HVAC system.

Hazard assessments must also be completed and documented in a Site Safety Plan within the scope of work for University contractors prior to beginning a project. According to the Workplace Safety and Health Act, contractors are responsible for ensuring airborne particles that may pose a risk to the safety or health of workers are controlled. There are many contaminants that can be introduced from construction related activities, each of which is treated on an individual basis.

Physical Plant also specifies in Sustainable Design Submittals the inclusion of a Low Volatile Organic Compound (VOC) - Emitting Material Declaration Form along with lists of the VOC contents in paints applied on site.

EH&S and Physical Plant work in close consultation and cooperation in assessment and remediation of IAQ problems.

Carbon Dioxide

The occupants of a building are the main source of carbon dioxide. Carbon dioxide is exhaled as a by-product of living processes and must be removed by the ventilation system. A faulty ventilation system could cause a buildup of carbon dioxide and a reduction of the normal concentration of oxygen. Physical Plant installed Carbon Dioxide monitors that drive the ventilation. Measurement of Carbon Dioxide is a good surrogate measure of how well the ventilation system is working in relation to the number of occupants. If the levels of carbon dioxide are high, it is assumed that there may not be adequate ventilation in the area and this in turn may allow for the buildup of other indoor pollutants.

The Occupational Safety and Health Administration (OSHA) and the American Conference of Governmental Industrial Hygienists (ACGIH) have set the workplace safety standards of 5000 ppm as an 8-hour time weighted average (TLV-TWA) exposure. The TLV-TWA is the average concentration for a normal 8-hour workday, 40-hour workweek to which nearly all workers may be exposed repeatedly, day after day without any adverse effects. This limit is intended as a guide in industrial situations only. The American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) recommends a concentration of Carbon dioxide no more than 700 ppm above the ambient air (outside) concentration in order to minimize human odours and maintain comfort.

The ASHRAE 62-1989 (Ventilation for Acceptable Indoor Air Quality) recommends a minimum ventilation rate) outdoor air intake of 15 cubic feet per minute per person. In offices the recommended ventilation is 20 cf/m per person.

Thermal Comfort - Temperature and Humidity

Thermal comfort depends on air temperature, humidity and air movement. When air movement is virtually absent and when relative humidity can be kept below 50%, the ambient temperature is the most important for maintaining thermal comfort. However, the temperature preferences varies greatly among individuals. Optimum temperature for most people is 20-23.5 C (winter) and 23- 26 C (summer). Optimum relative humidity is 30-60%. Because of other problems relating to Winnipeg winter, R.H may not be possible to be raised above 40%. Air velocity should be below 0.15 metres/second or 30 feet per minute (fpm).

Particulates - Dusts and Fibres

These can come from both indoor and outdoor sources. Particle size is important in determining whether or not inhaled dust can reach the lungs. Health hazard potential of specific dusts depends on their toxicity and on their particle size. Dusts in the range of 0.1-10 micrometre size can find their way into the throat and lungs, and can affect human health. Larger dust particles get trapped in the nose and extremely small dust particles (less than 0.1 micrometre) are exhaled after being inhaled.

Excessive levels of dust particles can adversely affect the skin, eyes and respiratory system with symptoms such as irritation of the eyes, nose, throat and skin as well as sneezing, coughing and respiratory problems. Some dusts are toxic – asbestos, silica, lead and mercury etc.

There is dust in indoor air where there are:

- Renovation and retrofitting activity
- Exposed building material such as concrete, insulating material
- Dust in the air intake
- Dust and debris in the air delivery and return dampers
- Dusty filters
- Dust deposits and odours around humidifiers
- Use of personal ultrasonic humidifiers
- Cigarette smoke
- Handling of dusty materials
- Paper shredders

Exposure controls - maintain an adequate filtration system, clean air circulation system regularly, frequent cleaning of areas where dust settles, and use dust suppression methods (e.g. local exhaust, working wet) where there is excessive dust from renovation or movement of materials.

Solvents – Volatile Organic Compounds (VOCs)

VOCs are given off by solvents in paints, coatings, paint thinners, paint removers, adhesives, caulking, carpets, photocopiers, acoustic ceiling tiles, air cleaners, cleaning agents, organic solvents, fabric softeners and tobacco smoke.

At low exposure levels, symptoms may include fatigue, headache, drowsiness, dizziness, weakness, joint pains, blurred vision, skin and eye irritation and general discomfort depending on the compound. As the exposure level increases, people may experience respiratory irritation, unpleasant odours and tightness in the chest, nausea and confusion. Some highly susceptible individuals may have severe reactions at very low levels.

Exposure Control – purchase of low VOC products, including textiles and paints, for office spaces, increase ventilation if contaminants are widespread throughout the area, store solvents and other materials mentioned above in a separate storage room equipped with adequate local exhaust, ensure adequate local exhaust in printing and photographic rooms, and keep containers closed when they are not in use.

Microbial Contaminants

Important sources are wetted areas due to leaks or floods – carpets, ceiling tiles, walls, and insulation. Excessive humidity, stagnant water in humidifiers and condensate pans, condensation on windows and moist and dark areas are possible sources of microbial growth such as fungal spores, moulds and bacteria. Viruses and contagious bacteria can be airborne from infected people. Microbial contaminants can cause allergic and asthma-like reactions. Some individuals may be hypersensitive to microbial exposures and show symptoms at very low exposure levels.

Exposure Controls - prevent accumulation of stagnant water, clean or remove fungus contaminated sites (wear correctly fitted respirators with HEPA cartridges), maintain relative humidity in the 30-50% range, discard potential sources of mould such as old newspapers and boxes, wash contaminated surfaces with dilute bleach (household bleach diluted 1:10), discard dirty and contaminated air filters and avoid using personal portable humidifiers. Physical Plant's Hazardous Building Materials portfolio under the Health and Safety office follow the [Provincial Guide](#) for mould.

Controlled Products Standard

The University Controlled Products Standard requires that laboratories using controlled products have minimum of ten air changes per hour and not have lab-air recirculated. In many situations, laboratories and general offices are in the same area. While this is not recommended, in many situations, especially in older buildings there is no alternative. In general, laboratories should be operated at slightly negative pressure, with respect to adjacent areas, to prevent pollution migrating into the building. Some laboratories also store solvents which could release VOCs into the air. The laboratories need to have ventilation on 24/7 basis.

LEED New Construction and Building Renovation (BD+C) Requirements

All Requests for Proposals (RFP) include a sustainable design component, even for renovation projects. Though opportunities are limited for these projects, consultants are required to follow requirements to the greatest extent possible.

See: <http://umanitoba.ca/campus/sustainability/resources/942.html>

LEED BD+C requires a minimum indoor air quality performance and provides further points for enhanced strategies, air quality assessments, and construction management plans involving air quality. As a

standard, the University of Manitoba follows ASHRAE 62.1-2010, Ventilation for Acceptable Indoor Air Quality, meeting the required minimum performance for LEED.

A Construction Indoor Air Quality Management Plan should contain the following protocols for during construction:

- HVAC Protection
- Source Control
- Pathway Interruption
- Housekeeping

Once construction is complete and prior to building occupancy, a protocol should be outlined for measuring air quality following construction and the plan for flushing-out the building before or during occupancy. In this section, contaminants should be identified with maximum allowable concentrations.

RFPs may include further air quality assessment components increasing the potential for LEED certification for a building construction or renovation project.

See: <http://umanitoba.ca/campus/sustainability/resources/942.html>

Reporting Health and Safety Concerns

See: http://www.umanitoba.ca/campus/health_and_safety/newsletter/April2004.pdf

The university registers and monitors all indoor air quality complaints and trends. When EH&S or Physical Plant's H&S receives a call for an IAQ related concern, staff conduct an informal walk through of the area, a check of people concerned and a check of others nearby. An instrument called P-TRAK is used to check ventilation/filtration efficiency of the HVAC system. P-TRAK measures ultra-fine particles and relative readings compared to outside and gives an indication of efficiency of the filters in operation in the HVAC system.

Environmental Health and Safety Office

Poor air quality can affect the comfort of staff and students in University facilities. EH&S staff can perform indoor air quality investigations to assess comfort factors such as temperature and humidity, and assess the effectiveness of the ventilation systems.

EH&S Air Quality Contacts

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As per the University of Manitoba's governing document for the [Health and Safety Policy and the EH&S Role](#) it is the responsibility of the EH&S to:

- Identify emerging trends and internal/external risks that may affect specific areas of the University as a whole

- Identify and evaluate options to deal with risks and providing recommendations for consideration
- Provide expertise, advice, guidance, technical support, and training
- Recommend and develop safety and health initiatives, systems, programs and approaches
- Recommend metrics so that progress or performance can be monitored

Employee Health and Safety Procedure

As per the University of Manitoba's governing document for the [Health and Safety Policy for Employees](#) and [Responses to Health and Safety Concerns – Employees](#) it is the responsibility of all employees to:

- Use reasonable care so as to protect their own safety and health and the safety and health of others affected by their actions
- Conduct all activities in accordance with safety and health rules and procedures established by the supervisor, Department Head and the University
- Take an action part in practicing safe and healthy work habits
- Immediately report any accident, injury or unsafe conditions to the appropriate supervisor
- Properly use and adequately care for personal protective equipment that is required for their activities
- Consult and cooperate with the local area [Safety and Health \(LASH\) Committee](#). The duty of the safety and health committee includes the receipt, consideration and disposition of concerns and complaints respecting the safety and health of employees
- When the LASH committee cannot resolve the concern, the employee can contact the University's Environmental Health and Safety Office (EH&S), employee's bargaining unit, or Workplace Safety and Health Branch of Manitoba's Labour and Immigration

*Please note that supervisors and the LASH committee can also request assistance from the EH&S.

General Training

See: http://www.umanitoba.ca/campus/health_and_safety/newsletter/April2004.pdf

See: http://umanitoba.ca/admin/vp_admin/risk_management/ehso/training/safety_for_supervisors.html

The Environmental Health and Safety and Physical Plant Health and Safety provide a number of essential programs which contribute to creating a safe and healthy working and learning environment at the University of Manitoba. Programs include:

Asbestos Awareness: This seminar introduces participants to the Asbestos Management Program undertaken by the University to identify, manage and control asbestos containing materials on campus. Topics covered include: what is asbestos and where is it on campus; hazards of exposure; responsibilities of supervisors and employees; testing for asbestos and procedures for identifying and controlling potential exposure.

Indoor Air Quality: This session will provide attendees with introductory information on the assessment of indoor air quality at the University. Topics will include discussion on IAQ indicators such as temperature, humidity, CO2 levels, and particulate-in-air. Techniques for gathering pertinent data and conducting user surveys will be discussed.

Air Quality Monitoring and Maintenance

Manitoba's Workplace Safety and Health Act indicates that if there is an airborne chemical or biological substance present in the workplace, an employer must monitor the substance regularly and implement control measures to ensure the substances remain below the occupational exposure limits. Monitoring must include the indication of the concentration of the substances and must be conducted following the requirements of the National Institute for Occupational Safety and Health Manual of Analytical Methods.

Controlled Products Standard for Air Quality

The University [Controlled Product Standard \(CPS\)](#) is a design standard including requirements for all areas where potentially hazardous chemical, biological or radioactive material are stored or in use. The CPS requires that laboratories using controlled products have minimum of 10 air changes per hour with no lab-air re-circulation. Laboratories should be operated at negative pressure with respect to adjacent areas, to prevent pollution migrating into the building. Some laboratories store solvents. Larger volumes should be stored in a Flammable Solvents Storage Room or in Flammable Liquids Storage Cabinets following prudent storage practices. Laboratories need to have ventilation on a 24/7 basis. A properly designed building/laboratory along with good laboratory practices that includes maintaining proper use, storage, disposal and good sanitation will go a long way in preserving/improving indoor air quality.

Clean Air Procedure

The [Clean Air Procedure](#) was set out, second to the Health and Safety Policy, to protect the health and safety of members of the University community by restricting the extent to which smoking is permitted on University property and the extent to which exhaust fumes may be released near buildings.

Procedures: The University will take steps to ensure that the quality of air for employees and students is maintained at a safe and comfortable level as far as is practicable.

- Smoking is a serious health hazard and the University of Manitoba reserves the right to prohibit smoking within its facilities and on its premises for reasons of public safety, and the protection of environmentally sensitive materials.
- Visitors, students and staff are not permitted to smoke in any of the following:
 - Universities buildings, or portion thereof; including buildings or facilities leased to others; and
 - Fleet of vehicles leased to, under the control of or owned by the University
- Smoking is prohibited within eight meters or twenty-five feet of any building entrance on the Fort Garry campus. In circumstances where 8 meters is not effective in controlling the migration or re-circulation of smoke into buildings, additional measures may be taken, including extending prohibited distances.
- In conjunction with the policy for the Health Science Centre, smoking is prohibited on any property owned or under the control of the University of Manitoba at the Bannatyne Campus.
- The University will designate through signage "No Idle Zones" around buildings, entrances and air intake sources on campus. Vehicles and motors shall not be permitted to exhaust fumes into the air in these "No Idle Zones".

Enforcement:

- It is the University's intent to maintain a clean air environment through a spirit of cooperation, mutual respect and understanding.
- Complaints about a breach of this Procedure by staff should be directed in writing to the staff member's supervisor or in the case of a breach by students, to the Office of Student Affairs. It shall be the responsibility of the supervisor or the Office of Student Affairs to direct the employee or student to comply with the Procedure. Complaints about a breach of this Procedure by visitors or the public may be directed to Security Services.
- Repeated failure to comply with this Procedure will result in disciplinary action in accordance with the appropriate collective agreement or University policy.

Asbestos Management Program Procedure

See <https://www.safemanitoba.com/Page%20Related%20Documents/resources/Asbestos%20Guide.pdf>

The University's Asbestos Management Program was established in 2002; it follows the Government of Manitoba Workplace Safety and Health Regulations and Guidelines, and applies to all University owner properties. The intent of this program is to:

- Identify which buildings and their respective building materials are and are not asbestos containing; an inventory of these materials is maintained, and updated upon maintenance/construction activities
- Inspect the University's inventory on an annual basis
- Coordinate the removal or repair of damaged or disturbed asbestos containing materials to ensure the health and safety of the University community
- Communicate asbestos information campus occupants and those who are hired to work near or on asbestos containing materials
- Educate the University community and visitors on asbestos, its health effects, and common building materials in which it can be found
- Train Physical Plant trades workers how to work near or on asbestos containing materials

Abatement work on campus is performed by pre-qualified asbestos abatement contractors. During their work, third party environmental consultants are retained on behalf of the University to monitor and inspect abatement activities. Phase contrast microscopy (PCM) air monitoring using the NIOSH 7400 method is conducted for each abatement on campus to ensure the abatement workers safety as well as the University community's; as such, air monitoring is performed both within and adjacent to the abatement work area. Asbestos air monitoring requirements in Manitoba are defined by the occupational exposure limit (OEL) of 0.1 fibres/mL; this number means that in an 8 hour work day for a 40 hour work week, workers who are not exposed to values above the OEL are not at risk for a lung related illness attributed to chronic asbestos exposure. The University exercises greater due diligence with this number, whereby we strive for values under 0.05 fibres/mL, as is seen in other provinces. Prior to dismantling high hazard abatements (Type 2 and Type 3), additional provincial standards are in place that require values less than 0.01 fibres/mL. Lastly, air monitoring is performed if there is known or suspect worker contamination to assist in establishing exposure levels.

Referenced Documents

1. Asbestos Management Program

https://umanitoba.ca/campus/physical_plant/health_safety/media/AMP_Original_Main_Document.pdf
[https://www.safemanitoba.com/Page Related Documents/resources/Asbestos Guide.pdf](https://www.safemanitoba.com/Page%20Related%20Documents/resources/Asbestos%20Guide.pdf)

2. Asbestos Containing Materials (ACM) Reference Guide

http://www.umanitoba.ca/campus/health_and_safety/asbestos/acm%20booklet/ACM%20Glossary%20Booklet%20R-031030%20FINAL-%20Complete.pdf

3. Notes on Indoor Air Quality

http://umanitoba.ca/campus/health_and_safety/chemsafety/IAQ.pdf

4. Environmental Health and Safety Newsletters

http://umanitoba.ca/admin/vp_admin/risk_management/ehso/media/EHSO_Newsletter_201501.pdf

http://www.umanitoba.ca/campus/health_and_safety/newsletter/April2004.pdf

5. Manitoba Workplace Safety and Health Regulations

http://umanitoba.ca/admin/vp_admin/risk_management/ehso/media/WSHRegs2007ConsolidatedVersion.pdf

6. EHSO Safety for Supervisors Training Presentation

http://umanitoba.ca/admin/vp_admin/risk_management/ehso/training/safety_for_supervisors.html

7. LEED – Indoor Environmental Quality

<http://umanitoba.ca/campus/sustainability/resources/942.html>

8. University of Manitoba Sustainability – Energy and Water

<http://umanitoba.ca/campus/sustainability/resources/942.html>

9. Governing Documents:

Response to Health and Safety Concerns

http://umanitoba.ca/admin/governance/governing_documents/operations/552.html

Health and Safety: Employees

http://umanitoba.ca/admin/governance/governing_documents/staff/1195.html

Health and Safety: EHSO Role

http://umanitoba.ca/admin/governance/governing_documents/staff/1198.html

Clean Air

http://umanitoba.ca/admin/governance/governing_documents/staff/688.html