First Nations (Alberta) Technical Services Advisory Group

“Be a leader with integrity by cooperatively providing a safe sustainable future for First Nations through quality technical services.”
Improving Indoor Air Quality

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What Is Indoor Air Quality?

IAQ refers to the air quality **in and around** buildings and structures, especially in relation to the **health and comfort** of building occupants.

IAQ is affected by gases, particulates, and microbial contaminants.
Improving Indoor Air Quality

1. History
2. Air Quality Concepts
3. Health Risks
4. Air Handling Equipment
5. Building Maintenance To Improve Indoor Air Quality
Air Quality History

In ancient times it was believed that certain diseases were caused by *miasma*, or ‘bad air’.

Miasma was considered to be a foul smelling mist filled with particles from decomposed matter.

This pervasive belief influenced populations to clean up waste and remove odors to improve the health of the community.
Air Quality History

Miasma theory supported sanitation reforms to combat bad odors in urban areas.

Improved sanitation led to improved public health.
Air Quality History

A canary in a coalmine is an example of a ‘sentinel species’.

These animals can sense or are affected by toxic elements more easily than humans, and can be used as an early warning signal.
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Air Quality Concepts

- Heating (Thermal Comfort)
- Ventilation
- Air Conditioning
- Contaminant Sources and Pathways
Concepts – Heat Source

Wood and coal furnaces release smoke into the home.

Natural gas and propane furnaces can leak fuel and/or smoke into the home.

Electric heaters cost more to run.
Concepts – Heat Distribution

- Hot air distribution uses fans and air ducts to convey hot air from the furnace to all areas of the building.
- Hot water distribution uses pumps and pipes to circulate hot water between the furnace and radiators spread around the building.
- Steam distribution is similar to hot water distribution, only the water is converted to steam.
Concepts - Ventilation

Ventilation is the provision of fresh (outdoor) air in place of air that has been used or contaminated. Ventilation can be accomplished using mechanical systems, such as fans, or it can be passive like an open window.

Ventilation is the **only** means of removing airborne contaminants from a building.
Concepts - Air Conditioning

Air conditioning is the process used to create a more comfortable indoor environment. This is accomplished by lowering air temperature, raising or lowering the humidity, and removal of contaminants.

Humidity refers to the amount of water vapor in the air. An indoor area with high relative humidity will feel warmer than areas at the same temperature which have a lower relative humidity. Low indoor humidity can result in discomfort from dry skin, cracked lips, and excessive thirst.
Concepts – Contaminants

A contaminant is anything which upsets the normal IAQ. As mentioned earlier it could be in the form of gases, particulates, or microbes.

Second-hand smoke, Radon, mold, allergens, carbon monoxide (CO), and asbestos are all contaminants.
Health Risks

Occupants that are most susceptible to poor air quality are:

- Young children
- The elderly
- People who have existing breathing or lung problems and illnesses (allergies, asthma, etc.)
Health Risks – Carbon Monoxide

Carbon monoxide (CO) is a colorless, odorless, and tasteless gas that is toxic to humans.

It is produced when a flame does not have enough oxygen to burn completely, as when operating a stove or internal combustion engine in an enclosed space.
Health Risks – Carbon Monoxide

Exposure to carbon monoxide:
At low levels symptoms include, headaches, tiredness, shortness of breath, and impaired motor functions.

At high levels or prolonged exposure to low levels, people may experience dizziness, chest pain, tiredness, poor vision, and difficulty thinking.

At very high levels, CO can cause convulsions, coma, and even death.
Health Risks – Carbon Monoxide

How to protect yourself:
- Maintenance of fuel burning appliances
- Get a CO detector
- Leave sources outside
Health Risks – Second-hand smoke

Second hand smoke (also called passive smoking) is the inhalation of smoke by persons other than the ‘active’ smoker.

Exposure to second hand smoke causes many of the same diseases as direct smoking, including lung cancer, and respiratory diseases.
Health Risks – Second-hand smoke
How to reduce the harm...
BE A RESPONSIBLE SMOKER
Health Risks - Mold

Mold is a type of fungus that grows in moist environments.

The most common health problem is an allergic reaction.

Mold exposure may also result in respiratory symptoms, exacerbation of asthma, and fungal infections.
Health Risks - Mold

How to prevent mold growth

- Control humidity
- Completely dry affected items within 48 hours
Health Risks - Mold

How to deal with mold

-Small affected area less than 1 square meter: remove with warm soapy water.

-Larger areas: contact your local Environmental Health Officer to obtain advice on cleaning the mold.
Health Risks - Mold

Unseen mold – additional risks
Mold can grow anywhere, inside walls, ceilings, and under carpets.
Leaking pipes may spill water where it is not easily visible.
Roof leaks may remain wet long before they are evident.
Health Risks

Radon
Health Risks

Sick Building Syndrome
Health Risks

Symptoms and sensitivity
Air Quality Equipment

Equipment is available to address nearly any indoor air quality issue.

- Heaters & AC units provide thermal comfort
- Air filters/purifiers remove contaminants
- Humidifiers/Dehumidifiers raise/lower humidity
- Air handlers and fans to provide ventilation
Air Quality Equipment - Heaters

Heaters come in many varieties depending on heat source, means of distribution, and integration with other systems.
Air Quality Equipment - Heaters

All heaters which burn fuel are a source of carbon monoxide and could contaminate the indoor air with the fuel itself.

Due to this risk, it is recommended that any fuel burning heater receives regular maintenance and is inspected on an annual basis.
Air Quality Equipment - Filters

Air filters and purifiers work to remove contaminants from the air and contain them within the filter itself.

Air filters may be incorporated into an air distribution system, or they may be standalone units.

Always follow the furnace manufacturer’s recommendations regarding frequency of filter changes.
Air Quality Equipment - Humidity

The building must strike a balance between risk from mold and comfort of occupants.

Accordingly, building wide humidification is discouraged. Building inhabitants who are sensitive to dry air may use small ‘personal’ humidifiers to increase their comfort levels without putting the building at risk for mold growth.
Air Quality Equipment – Air Ducts

Even though the air travelling through the ducts is filtered, dust can build up over the years.

It is recommended that air ducts be cleaned professionally every 3 to 5 years.

Vents must be kept clean and unobstructed.
Building Maintenance

Maintenance personnel rely on the building occupants to act as air quality sentinels.

All complaints should be investigated.

Special attention should be given to buildings occupied by at-risk persons.
Building Maintenance

Contaminant source control:
Effort should be taken to prevent air quality problems before they start. This is best accomplished by removing sources of contamination from the building or reducing the source if it cannot be removed.
Building Maintenance

Ventilation modification:
Modification of the ventilation arrangement in a building is often used to correct or prevent indoor air quality problems. This approach is effective where buildings are under ventilated or where a particular contaminant source cannot be identified.
Building Maintenance

Air cleaning:
Air quality can be improved by removing the contaminants from the air.

-Filtering
-Electrostatic precipitation
-Gas sorption
Building Maintenance

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- Filtering
- Electrostatic precipitation
Building Maintenance

Exposure control:
Exposure control is an administrative approach to contaminant mitigation. It uses behavioral methods to limit unnecessary contaminant exposure.

Schedule contaminant producing activities to occur during unoccupied periods.
Move susceptible individuals away from the area where they experience symptoms.
Additional resources

For additional information about indoor air quality, please visit these websites.

Healthycanadians.gc.ca – Air Quality

EPA.gov – An Introduction to Indoor Air Quality