



A Guide to Indoor Air Quality

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Common Causes of Poor Indoor Air Quality (IAQ)

Numerous indoor air quality investigations over the last decade by the National Institute for Occupational Safety & Health (NIOSH) have found the primary source of indoor air quality problems are:

Inadequate ventilation	52%
Contaminant from inside the building	16%
Contaminant from outside the building	10%
Microbial contamination	5%
Contamination from building fabric	4%
Unknown Sources	13%

Major Indoor Air Contaminants

The following are common contaminants found in indoor air:

Carbon Monoxide

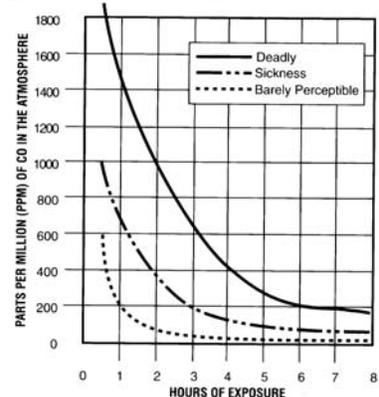
Sources

engine exhaust, poorly vented and/or improperly functioning boilers and gas appliances, some UNR lab operations, & tobacco smoke

Acute Health Effects

headache, dizziness, nausea, cardiovascular effects, unconsciousness

EFFECTS OF CARBON MONOXIDE



Formaldehyde

Sources

preserved tissue specimens and cadavers, plywood, particle board, and paneling, carpeting, glues & adhesives, urea formaldehyde foam insulation, & tobacco smoke

Acute Health Effects

mucous membrane irritation, skin rashes, hypersensitive or allergic reactions

Nitrogen Oxides

Sources

combustion products from gas furnaces and appliances, welding, engine exhaust, & tobacco smoke

Acute Health Effects

eye, respiratory, & mucous membrane irritation

Ozone

Sources

copy machines, electrostatic air cleaners, electrical arcing, & photochemical smog

Acute Health Effects

eye, respiratory, & mucous membrane irritation; chronic respiratory disease aggravation

Volatile Organic Compounds (VOC's)

Sources

paints, cleaning compounds, mothballs, adhesives, silicone caulking materials, pesticides, asphalt, dry drain traps, cosmetics, UNR lab operations, & tobacco smoke

Acute Health Effects

dizziness, nausea, mucous membrane & respiratory tract irritation, headache, fatigue

Environmental Tobacco Smoke (ETS)

Sources

cigarettes, cigars, & pipe tobacco

Acute Health Effects

Upper respiratory irritation, coughing, wheezing, sneezing, headache, sinus problems

Microorganisms and other Biological Contaminants

Sources

cooling towers, water damaged materials, damp organic material, high humidity indoor areas, hot water systems, animal droppings, & air handling system condensate

Acute Health Effects

hypersensitivity pneumonitis, humidifier fever, allergic rhinitis, chills, fever, muscle ache, chest tightness, headache, cough, sore throat, diarrhea, nausea

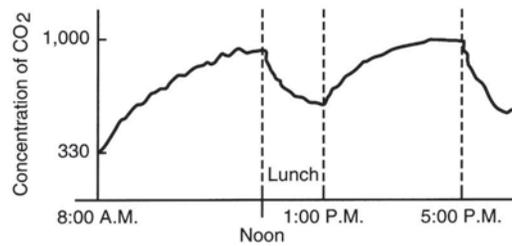
Indoor Air Quality Assessment

Methods of indoor air quality assessment at UNR include:

- employer and employee interviews
- walk around inspections of potential contaminant sources & building ventilation systems
- environmental monitoring

Employee interviews are conducted to assess recent or ongoing building renovations, identify potential contaminant sources (water leaks & building processes), and to determine the existence of complaint patterns (seasonal & temporal). A walkthrough inspection is conducted to identify potential areas of concern and to determine if monitoring and/or sample collection is required.

Environmental monitoring may then be performed to evaluate *indoor air quality indicators* such as temperature, humidity, and carbon dioxide. Carbon dioxide measurement can provide information regarding adequacy of supply air, fresh air (ASTM D6245-98), and cycle times of facility air handling equipment. The following diagram illustrates the buildup of indoor carbon dioxide (due to occupant exhalation) throughout a normal day.



Carbon Dioxide Concentration (ppm)	Results
250-350	normal outdoor ambient air
600	minimal air quality complaints
600-1000	effect on indoor air quality is less clearly interpreted
1000	indicates inadequate ventilation; indoor air quality complaints are more widespread

When *specific contaminants* of concern are identified air sampling may be conducted to aid with risk assessment. The [Environmental Health and Safety Department](#) has the capability to conduct monitoring for a wide variety of indoor air contaminants including organic and inorganic vapors, & particulates. Additionally, the [Environmental Health and Safety Department](#) has expertise and equipment to fully evaluate the performance of building ventilation systems.

Prevention & Correction of Indoor Air Quality Problems

Provide Adequate Fresh Air

Make-up air that contains adequate fresh air should always be supplied during occupancy. The American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) recommends at least 20 cubic feet per minute of fresh outside air per person. Air supply diffusers should be open, clean, and unobstructed so that air can be properly supplied and mixed in occupied areas. Building supply air should be properly filtered to prevent introduction of outside particulate contaminants, such as dust and pollen, to occupied spaces. A preventative maintenance program should also be implemented which ensures timely filter changes, belt adjustment/replacement, general inspection of ductwork, and system balance.

Eliminate or Control Potential Sources of Chemical Contaminants

Use local exhaust ventilation to control chemical contaminants generated from processes within the facility or laboratory. Local exhaust ventilation should be totally separate from HVAC system and exhausted outside in a manner to avoid re-circulating or re-drawing contaminants into occupied areas. Outside building

air intakes should be located away from areas of potential contaminants such as loading docks, vehicle drop-off areas, pollen generating plants & trees, and facility exhausts.

Renovation including painting, carpet laying, and concrete or drywall cutting should be performed during unoccupied periods. Whenever possible physical barriers & ventilation should be used during these activities.

Eliminate or Control Potential Sources of Microbial Contaminants

Promptly repair water leaks and replace water damaged porous furnishings, carpets, upholstery, and ceiling tiles. Humidity should be maintained below 60% in all occupied areas and summer cooling coils should run below 56°F to properly dehumidify conditioned air.

Proper maintenance of air handling units is critical. Drain pans and cooling coils should have continuous drainage and be cleaned/disinfected where moisture growth has caused microbial growth.

HELP!!!

If you have questions about indoor air quality in your work area, please contact the Environmental Health & Safety Department.

[Environmental Health & Safety Department](#) - 327-5040

[Rich Stone, Industrial Hygienist](#) - 327-5055

[Ben Owens, Chemical Hygiene Officer](#) - 327-5196

Other Resources

[UNR Exhaust Ventilation System Policy](#)

[EPA IAQ Page](#)

[EPA/NIOSH Guide to Building Air Quality](#)

[OSHA Proposed IAQ Standard](#)

[California IAQ Program](#)

[American Lung Association IAQ Page](#)