

Indoor Air Quality

Indoor Air Quality (IAQ) is a term which refers to the air quality within and around buildings and structures, especially as it relates to the health and comfort of building occupants.

What Causes Indoor Air Problems in Commercial Buildings?

Indoor pollution sources that release gases or particles into the air are the primary cause of indoor air quality problems in Commercial buildings and homes. Inadequate ventilation can increase indoor pollutant levels by not bringing in enough outdoor air to dilute emissions from indoor sources and by not carrying indoor air pollutants out of the home.

High temperature and humidity levels can also increase concentrations of some pollutants.

Pollutant Sources

There are many sources of indoor air pollution in any property. These include combustion sources such as oil, gas, kerosene, coal, wood, and tobacco products; building materials and furnishings as diverse as deteriorated, asbestos-containing insulation, wet or damp carpet, and cabinetry or furniture made of certain pressed wood products; products for household cleaning and maintenance, personal care, or hobbies; central heating and cooling systems and humidification devices (not common in commercial buildings but often used in Data Centers); and outdoor sources such as radon, pesticides, and outdoor air pollution.

The relative importance of any single source depends on how much of a given pollutant it emits and how hazardous those emissions are. In some cases, factors such as how old the source is and whether it is properly maintained are significant. For example, an improperly adjusted gas stove can emit significantly more carbon monoxide than one that is properly adjusted.

Some sources, such as building materials, furnishings, and products (like air fresheners), release pollutants more or less continuously. Other sources, related to activities carried out in a business, release pollutants intermittently. Some of these activities may include smoking, the use of unvented or malfunctioning stoves, furnaces, or space heaters, the use of solvents in cleaning and hobby activities, the use of paint strippers in redecorating activities, and the use of cleaning products and pesticides in house-keeping. High pollutant concentrations can remain in the air for long periods after some of these activities.

Amount of Ventilation

If too little outdoor air enters a building, pollutants can accumulate to levels that can pose health and comfort problems. Commercial buildings are typically built with special mechanical means of ventilation; however, multifamily and single residences are often not.

Homes that are designed and constructed to minimize the amount of outdoor air that can "leak" into and out of the home may have higher pollutant levels than other homes. All new homes, if constructed properly, will be of very tight construction.

Also, because some weather conditions can drastically reduce the amount of outdoor air that enters a home, pollutants can build up even in homes that are normally considered "leaky".

How Does Outdoor Air Enter a Commercial building?

Outdoor air enters and leaves a Commercial building by: infiltration, natural ventilation, and mechanical ventilation. In a process known as infiltration, outdoor air flows into the building through openings, joints, and cracks in walls, floors, and ceilings, and around windows and doors. In natural ventilation, air moves through opened windows and doors if they exist in the commercial construction. Air movement associated with infiltration and natural ventilation is caused by air temperature differences between indoors and outdoors and

by wind. Finally, there are a number of mechanical ventilation devices, from outdoor-vented fans that intermittently remove air from a single room, such as bathrooms, electrical rooms, data rooms, compressor rooms, kitchens, etc., to air handling systems that use fans and duct work to continuously remove indoor air and distribute filtered and conditioned outdoor air to strategic points throughout the building. The rate at which outdoor air replaces indoor air is described as the air exchange rate. When there is little infiltration, natural ventilation, or mechanical ventilation, the air exchange rate is low and pollutant levels can increase.

Indoor Air Pollution and Health

Health effects from indoor air pollutants may be experienced soon after exposure or possibly even years later.

Immediate effects

Immediate effects may show up after a single exposure or repeated exposures. These include irritation of the eyes, nose, and throat, headaches, dizziness, and fatigue. Such immediate effects are usually short-term and treatable. Sometimes the treatment is simply eliminating the person's exposure to the source of the pollution, if it can be identified. Symptoms of some diseases, including asthma, hypersensitivity pneumonitis, and humidifier fever (PDF), may also show up soon after exposure to some indoor air pollutants.

Long-term effects

Other health effects may show up either years after exposure has occurred or only after long or repeated periods of exposure. These effects, which include some respiratory diseases, heart disease, and cancer, can be severely debilitating or fatal. It is prudent to try to improve the indoor air quality in your Commercial building and to always check on and maintain your Mechanical systems as well as other factors. *Please see the checklist.*

While pollutants commonly found in indoor air are responsible for many harmful effects, there is considerable uncertainty about what concentrations or periods of exposure are necessary to produce specific health problems. People also react very differently to exposure to indoor air pollutants. Further research is needed to better understand which health effects occur after exposure to the average pollutant concentrations found in homes and which occurs from the higher concentrations that occur for short periods of time.

45 Point IAQ Checklist

By: Alex Tompsidis

| Item | Area | Description | Good | Bad |
|------|---------------------------|---|--------------------------|--------------------------|
| 1 | Air Intakes | Relation of plumbing vents to air intakes | <input type="checkbox"/> | <input type="checkbox"/> |
| 2 | | Relation of exhaust fans and louver to air intakes | <input type="checkbox"/> | <input type="checkbox"/> |
| 3 | | Relation of generator exhaust to air intakes | <input type="checkbox"/> | <input type="checkbox"/> |
| 4 | | Relation of boiler stacks to air intakes | <input type="checkbox"/> | <input type="checkbox"/> |
| 5 | | Relation of incinerator stacks to air intakes | <input type="checkbox"/> | <input type="checkbox"/> |
| 6 | | Relation of parking garage to air intakes | <input type="checkbox"/> | <input type="checkbox"/> |
| 7 | Cooling Tower Exhaust | Discharge air vapor mix passes in front of operable window | <input type="checkbox"/> | <input type="checkbox"/> |
| 8 | | Discharge air vapor mix passes in front of air intake louver | <input type="checkbox"/> | <input type="checkbox"/> |
| 9 | | Discharge air vapor mix passes in front of any thru the wall louver | <input type="checkbox"/> | <input type="checkbox"/> |
| 10 | Architectural Enclosure | Top of cooling tower is at or below top of enclosure | <input type="checkbox"/> | <input type="checkbox"/> |
| 11 | | Air intakes share enclosed area with cooling tower | <input type="checkbox"/> | <input type="checkbox"/> |
| 12 | | Air intakes share enclosed area with exhaust fans | <input type="checkbox"/> | <input type="checkbox"/> |
| 13 | | Air intakes share enclosed area with plumbing vents | <input type="checkbox"/> | <input type="checkbox"/> |
| 14 | Air Intakes @ Grade Level | Adjacent to exhaust louvers | <input type="checkbox"/> | <input type="checkbox"/> |
| 15 | | Adjacent to street or parking | <input type="checkbox"/> | <input type="checkbox"/> |
| 16 | | Adjacent to trash receptacle or dumpster | <input type="checkbox"/> | <input type="checkbox"/> |
| 17 | Air Handlers | Intake plenum is used for storage space | <input type="checkbox"/> | <input type="checkbox"/> |
| 18 | | There is air leakage around the filters | <input type="checkbox"/> | <input type="checkbox"/> |
| 19 | | There is a sloped condensate pan | <input type="checkbox"/> | <input type="checkbox"/> |
| 20 | | There is standing water in the drain pan or on the floor | <input type="checkbox"/> | <input type="checkbox"/> |
| 21 | | The air handlers are double wall construction. Cleanable interior. | <input type="checkbox"/> | <input type="checkbox"/> |
| 22 | | The air handler have removable sections and/or multiple access pts | <input type="checkbox"/> | <input type="checkbox"/> |
| 23 | | There is a magnehelic manometer gauge across the filter section | <input type="checkbox"/> | <input type="checkbox"/> |
| 24 | | The "Hi-Static" set point of the filter gauge is noted | <input type="checkbox"/> | <input type="checkbox"/> |
| 25 | | There is a DDC differential pressure and alarm across the filter unit | <input type="checkbox"/> | <input type="checkbox"/> |
| 26 | | Air filters appear wet or moist | <input type="checkbox"/> | <input type="checkbox"/> |
| 27 | | Unit duct-lining is exposed and is deteriorating | <input type="checkbox"/> | <input type="checkbox"/> |
| 28 | | Rust or rust-flaking is visible on interior surfaces | <input type="checkbox"/> | <input type="checkbox"/> |
| 29 | | Fan wheels of air handlers have accumulated dirt | <input type="checkbox"/> | <input type="checkbox"/> |
| 30 | | Rest of unit including control dampers is dusty, dirty, moist... | <input type="checkbox"/> | <input type="checkbox"/> |
| 31 | | Dampers on units have blade and edge seals. i.e. "Low Leak" | <input type="checkbox"/> | <input type="checkbox"/> |
| 32 | Building Systems | Demand controlled ventilation controls or traditional | <input type="checkbox"/> | <input type="checkbox"/> |
| 33 | | Any carbon dioxide sensors installed | <input type="checkbox"/> | <input type="checkbox"/> |
| 34 | | Any VOC sensors installed | <input type="checkbox"/> | <input type="checkbox"/> |
| 35 | | DOES BUILDING OWNER HAVE AN IAQ POLICY | <input type="checkbox"/> | <input type="checkbox"/> |
| 36 | | Have issued awareness letter to tenants regarding IAQ, IAQ activity | <input type="checkbox"/> | <input type="checkbox"/> |
| 37 | | Continuously measure carbon dioxide levels | <input type="checkbox"/> | <input type="checkbox"/> |
| 38 | | Continuously RECORD and DOCUMENT CO ₂ levels | <input type="checkbox"/> | <input type="checkbox"/> |
| 39 | | Boxes properly sized to deliver air volume and minimum 3 A/C/hour | <input type="checkbox"/> | <input type="checkbox"/> |
| 40 | | Do interior boxes have hot water or electric reheat | <input type="checkbox"/> | <input type="checkbox"/> |
| 41 | | What is interior VAV box minimum position | <input type="checkbox"/> | <input type="checkbox"/> |

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|----|---|--------------------------|--------------------------|
| 42 | Multiple air outlets sized at lower cfm, for proper air diffusion | <input type="checkbox"/> | <input type="checkbox"/> |
| 43 | Ductwork sized properly and/or looped so that air can reach boxes | <input type="checkbox"/> | <input type="checkbox"/> |
| 44 | Does building have a DDC control system | <input type="checkbox"/> | <input type="checkbox"/> |
| 45 | Is the building HVAC system regularly and properly SERVICED | <input type="checkbox"/> | <input type="checkbox"/> |