INDOOR AIR ALLIANCE

CLEAN AIR FOR HEALTHY LIVING

Healthy Home Guidelines

These residential guidelines are published for the benefit of consumers and professionals interested in indoor air quality issues. They are not meant to be inclusive of every situation nor to replace the education, advice or intuition of an IAQ or Healthcare professional in the home.

These Guidelines describe levels of indoor air constituents that the IAA feels will adversely affect health. It is important to note that these are general guidelines. Those with COPD, Alpha-1, Asthma and other upper respiratory illness may find they can only tolerate lower levels.

Volatile Organic Compounds (VOC's) can come from a variety of sources in the home, including paint; aerosol sprays; solvents; harsh cleaning products; pressed wood products; tobacco smoke; fuel burning appliances; hobby supplies; carpet and carpet padding; and glues. General health effects include: eye, nose and throat irritation; allergic reactions, including skin rash; fatigue; wheezing and coughing; headache, nausea and loss of coordination; central nervous system, liver and kidney damage. Some organic compounds are suspected or known to cause cancer in animals and humans.

Guidelines
Should not exceed .5 PPM

Dust / Particulate is microscopic material that is suspended in air. It is a complex and changing mix of very fine solids and even liquid that can be inhaled through the sinuses and deep into the lungs. This mix can include allergens such as dust; plant and insect fragments (especially from dust mites and cockroaches); fungi; pollen; and human and animal dander (skin flakes). It can also include viruses, bacteria and potentially toxic substances from sources such as car exhaust and other fumes.

Everyone should be concerned with controlling indoor particulate levels. These substances can not only trigger and exacerbate symptoms of allergies, asthma, COPD, Alpah-1 and other upper respiratory illnesses; they can also potentially worsen the general health of those exposed. This is a very important consideration for sensitive populations such as the elderly, people with circulatory, respiratory or other health concerns, pregnant women, and children.

9640 East Kent Place
Aurora CO 80014
800-772-7067
info@indoorair.org

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NOTE: It is important to remember that most particulate sensors measure and report the quantity of particles in a given air sample. Most often they are not able to chemically or physically characterize the different types or sizes of particles measured.

Guidelines
Should not exceed 30ug/m3

Carbon Monoxide (CO) is a colorless, odorless gas that can pose a significant health risk. CO is byproduct of burning fuels such as gasoline, wood, oil, kerosene and charcoal. Inhaled CO enters the blood stream, decreasing the blood's ability to carry oxygen to the body's organs and tissues. Exposure to high CO levels can result in death. Exposure to moderate CO levels can cause severe headaches, dizziness, reduced mental function, nausea, or fainting; and exposure to low CO levels low can cause shortness of breath, mild nausea, or mild headaches. Some of these symptoms may be misdiagnosed as flu, food poisoning, or other illnesses. Elevated levels of CO should be identified and corrected as soon as possible. You can take action to reduce CO levels and keep them below an unhealthy level. It is important to follow all manufacturer ventilation and maintenance guidelines for any heating, cooking, or fuel-burning appliance used in the home.

Elevated CO may be present in any type of space for a number of reasons: most commonly due to inappropriately exhausted combustion processes. This insidious toxic gas is odorless, and often goes undetected prior to detrimental levels of exposure, which may lead, to short-term productivity issues and to long-term health effects**.**

Typical Sources of Carbon Monoxide
Elevated CO may be present in any type of space for a number of reasons: most commonly due to inappropriately exhausted combustion processes. Unvented kerosene and gas space heaters; leaking chimneys and furnaces; back-drafting from furnaces, gas water heaters, wood stoves, and fireplaces; gas stoves; generators and other gasoline powered equipment; automobile exhaust from attached garages; and tobacco smoke. Incomplete oxidation during combustion in gas ranges and unvented gas or kerosene heaters may cause high concentrations of CO in indoor air. Worn or poorly adjusted and maintained combustion devices (e.g., boilers, furnaces) can be significant sources, or if the flue is improperly sized, blocked, disconnected, or is leaking. Auto, truck, or bus exhaust from attached garages, nearby roads, or parking areas can also be a source.

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Guidelines
CO levels in homes without gas stoves vary from 0.5 to 5 parts per million (ppm). Levels near properly adjusted gas stoves are often 5 to 15 ppm and those homes with poorly adjusted stoves may be 30 ppm or higher.

Relative Humidity (RH) is directly related to temperature - warm air can hold more moisture than cool air. This is why condensation can form on cool surfaces such as the exterior walls of a room and on windows. Extended periods of high indoor RH can facilitate the growth of molds, mildews, fungi, bacteria, viruses and dust mites. These contaminates and substances they produce can cause eye, nose, and throat irritation, shortness of breath, dizziness, lethargy, fever, digestive problems, asthma, or influenza and other infectious diseases. Extended periods of low RH can also affect the human body. Breathing dry air depletes body fluids, which can worsen problems associated with asthma, bronchitis, sinusitis, nosebleeds and general dehydration. Low humidity can irritate and dry the skin and eyes. Extended periods of low RH can deteriorate wood and other objects in the home and increase static electricity. Low RH also makes air feel cooler, so a higher thermostat setting is required to achieve the same level of warmth, thus increasing the cost of home heating bills.

Common sources of excess humidity are water leaks, poor insulation, people and household pets, poorly maintained humidifiers, air conditioners, showers, baths, outside air infiltration, insufficient ventilation, and indoor-vented clothes dryers and cooking ranges. Venting humid air into the living space or attic can cause moisture buildup. Typical signs of excess humidity are wet or moist walls, ceilings, windows, and furniture.

Guidelines
35% to 65% is a comfortable range

Temperature control is important for personal comfort, health and cost savings. Buildings that are drafty, with poor HVAC design and function or inadequate insulation can exhibit large temperature swings during a day. These fluctuations can be very uncomfortable for building occupants and result in very high utility bills. Extreme changes in temperature can also trigger and worsen asthma conditions. Temperature that is maintained at too low a level can also increase RH, potentially leading to the growth of molds and mildew and their potentially harmful health effects described above.

Guidelines
There are no established guidelines here. Typically homeowners set temperature based on comfort, not health.

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Carbon Dioxide (CO2) is a gas naturally found in outdoor air at concentration of approximately 350 PPM. Indoor CO2 levels are generally higher than outdoor level as a result of building occupant respiration. Carbon dioxide is typically not an immediate health risk. Instead, this Guideline serves as an indicator for the amount of fresh-air ventilation being supplied to the home. Adequate fresh air ventilation maintains low CO2 levels, dilutes contaminates such as particulates, odors and other gasses and contributes to a comfortable environment.

Low CO2 concentration, when measured during periods of average and higher occupancy, implies that human generated pollutants are being properly diluted. And in absence of a specific pollutant source, it is a rough estimator that the thousands of potential building generated pollutants are being dispersed. This makes it a key indoor air quality indicator.

Typical Sources of Carbon Dioxide

The concentration of CO2 in the exhaled breath of building occupants approaches 40,000 ppm. An estimated CO2 generation rate of 0.6 cfm/min (0.3 l/s) per occupant is typically assumed. This will usually increase the CO2 concentrations in the occupied space above the outdoor, ambient levels. The greater the outdoor (dilution) air ventilation rate, generally the less increase in CO2 that will be observed.

In general, CO2 will only be of concern as a toxic gas itself in industrial processes where bottled CO2 gas is utilized, such as breweries and fire extinguisher mfg, or when there is an inadequately ventilated combustion process (where the other combustion gases will normally be of much greater concern). Generally, house plants will have an insignificant impact in reducing the CO2 concentrations that result from human occupation.

Guidelines

Outdoor CO2 levels are usually around 350ppm (although they may often be 100-200ppm higher in urban areas). In homes without children the guideline is 800ppm. In homes with children, the guideline is 600ppm.

Mold is found in every region of the U.S.. There are no guidelines for the types or levels of mold that are unacceptable in a home. Mold allergies can often exacerbate upper respiratory illnesses. Please consult with a Certified Mold Professional for further information and evaluation.

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Radon is the number one cause of lung cancer among non-smokers, according to EPA estimates. Overall, radon is the second leading cause of lung cancer. Radon is responsible for about 21,000 lung cancer deaths every year.

Radon in air is ubiquitous. Radon is found in outdoor air and in the indoor air of buildings of all kinds. EPA recommends homes be fixed if the radon level is 4 pCi/L (pico Curies per Liter) or more. Because there is no known safe level of exposure to radon, EPA also recommends that Americans consider fixing their home for radon levels between 2 pCi/L and 4 pCi/L. The average radon concentration in the indoor air of America's homes is about 1.3 pCi/L. It is upon this level that EPA based its estimate of 20,000 radon-related lung cancers a year upon. It is for this simple reason that EPA recommends that Americans consider fixing their homes when the radon level is between 2 pCi/L and 4 pCi/L. The average concentration of radon in outdoor air is .4 pCi/L or $1/10^{th}$ of EPA's 4 pCi/L action level.

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