

According to the American lung Association, the top five indoor air pollutants include:

- carbon monoxide (CO): desired amount = zero (0)
- formaldehyde (HCHO): desired amount = zero (0)
- Microbial contaminants and Particulate Matter (PM) (mold, dust mites, etc.): desired amount = zero or very low value - < 50 ppm
- Secondhand tobacco smoke: desired amount = zero (0)
- Volatile organic compounds (VOC's) and total VOC's (TVOC's): desired amount = zero (0)

We test for all of these.

Carbon monoxide (CO):

We do test for carbon monoxide, however we do recommend a fire alarm combined with a carbon monoxide detector in the home for constant monitoring, even if no carbon monoxide is found at the time of testing. 0.0 Carbon Monoxide is the ideal limit, and is the amount in normal fresh air. 35 ppm (parts per million) is a NIOSH 10 hour "low alarm" value. As carbon monoxide increases the danger to health also increases and at 1,600 ppm dizziness occurs within 20 minutes, and death within an hour.

Formaldehyde (HCHO):

It has recently been suggested by the international agency for research on Cancer, the National toxicology program, and the US EPA that formaldehyde is causally associated with nasopharyngeal cancer and leukemia. Less severe manifestations of formaldehyde exposure in the home include nasal and irritation, neurological effects, and increased risk of asthma and/or allergy have been observed in humans breathing 0.1 to 0.5 mg/m³ it may cause chest pain, shortness of breath, coughing, and nose and throat irritation.

According to a 1997 report by the US Consumer Product Safety Commission, formaldehyde is normally present in both indoor and outdoor air at low levels, usually less than 0.03 ppm. Materials containing formaldehyde can release formaldehyde gas or vapor into the air. Most formaldehyde is released from products in your home within two years of introducing them to the home.

Formaldehyde is released from a variety of different substances in the home. Carpeting, flooring, particleboard, softwood plywood subfloor, fiberglass insulation under drywall, furniture made of particleboard, cigarettes, gas oven, decorative paneling (wood veneer), kerosene heater, and furniture made of medium density fiberboard, particleboard underlayment with carpet and cushion, urea formaldehyde foam insulation. Urea-based foam insulation and particleboard out of this group emit the most formaldehyde per square foot.

An indoor air level exposure limit of 0.1 ppm of formaldehyde is recommended. Ideally we would like less than 0.1 mg/m³ in indoor air. Please compare your test value to this value.

How can you lower the amount of formaldehyde in your home?

In short, open windows when possible, use exhaust fans to exhaust air from the home, control the temperature, and maintain a smoke free home.

- Open windows for a few minutes every day to let fresh air in, unless you have asthma triggered by outdoor air pollution or pollen or you're concerned about safety.
- Installing and use exhaust fans as much as possible.
- Keep the temperature and humidity inside your home at the lowest comfortable setting.
- Make your home smoke free. Don't allow anyone to smoke in your home.

Choose home products with low or no formaldehyde for future purchases. Look for

- new furniture, wood cabinetry, or flooring made without urea formaldehyde glues
- pressed-wood products that meet ultra-low emitting formaldehyde (ULEF) or no added formaldehyde (NAF) requirements
- products labeled "no VOC/low VOC" (volatile organic compound)
- insulation that does not have UF foam

Reduce formaldehyde from new products.

- Wash permanent press clothing and curtains before using them new
- let new product release formaldehyde outside of your living space before you install or use them inside, for example in a garage around a patio. If possible, keep them out of your living space until you can no longer smell a chemical odor.

Microbial contaminants:

Your testing may have included mold, dust mites and other microscopic agents in the air. If so you will find the results and explanation thereof, in the laboratory report itself. Dangerous molds are identified whether they themselves are toxic, or their spores are toxic, or they produce toxic substances and gases which are released into the environment. Please review your laboratory report and if you have any questions contact us and we will explain what the results mean. (These contaminants may also contribute to particulate matter, PM, counts). dr_e@awsa.info

Secondhand tobacco smoke:

Secondhand tobacco smoke produces both formaldehyde and particulate matter (PM) of less than 2.5 μm diameter. These particles are small enough to enter the lung, passing through airway passages all the way to the air sacs in the lung. They can cause serious damage in these sensitive tissues.

Particulate matter (PM):

Particulate matter in the laboratory results will be broken down into particulate matter which is 1 μm in diameter, 2.5 μm in diameter, and particles that are 10 or more microns in diameter. So the number next to the PM stands for the size diameter in micrometers of the particles. A PM of 2.5 μm includes everything smaller than 2.5 μm , thus it includes the 1 μm particles as well. The same is true for 10 μm particles. They include both the 1 μm and the 2.5 μm particles. Thus, if the one micrometer particles are present in high numbers then that will be reflected in high numbers of 2.5 μm and 10 μm diameter particles. High numbers of 10 μm particles does not mean you will have high numbers of 2.5 μm or 1 μm particles. So, PM 2.5 is particulate matter 2.5 μm and below. These are small particles floating in the air. These particles come from lots of sources, such as dust blown up from the wind, coal particles from power plants and home heating, car exhaust, pollen from plants, and other operations that involve the burning of fuel such as wood, heating oil or coal and natural sources such as forest and grass fires. Some indoor activities that produce fine particles of 2.5 μm diameter and smaller, are tobacco smoking, cooking, (for example frying, sautéing, and broiling), burning candles or oil lamps, and operating fireplaces and fuel-burning space heaters such as kerosene heaters. Particles less than 2.5 μm in diameter (PM 2.5) which include submicron particulates (less than 1 μm in diameter) are referred to as fine or respirable particulates and are believed to pose the greatest health risk

Short-term health effects are, nose, throat and chest irritation, coughing, sneezing running nose and shortness of breath. If the particle count is high it can aggravate lung conditions such as chronic obstructive pulmonary disease, asthma, bronchitis, and other lung conditions associated with various diseases. Typical values and their health effects for PM 2.5 particles (which includes 1 μm particles) are shown below:

PM 2.5:-fine particles

0- 50 particles: good

51-100 particles: moderate health effect

101-150 particles: unhealthy for sensitive groups

151-200 particles: unhealthy

201-300 particles: very unhealthy

301-500 particles: hazardous

Weather reports will often include the level of danger due to particulates which include smog

VOC' s and TVOC' s:

Volatile organic compounds (VOC's) and total volatile organic compounds (TVOC's) are chemical compounds that are found in the air, and may be irritants or dangerous to health. They include chemicals coming from paints, varnishes, and wax, many cleaning

products and disinfectants, cosmetic products, degreasing products, and hobby products. Fuels are made up of organic chemicals. All of these products can release organic compounds while you are using them and to some degree, when they are stored.

The 10 most common VOCs in the home include:

1. Acetone: found in nail polish remover's, furniture polish, and wallpaper
2. Benzene: found in paint, glue, carpeting, and emissions from gasoline combustion
3. Butanal: found in emissions from barbecues, burning candles, stoves and cigarettes (Beeswax candles do not emit Butanal and help purify air)
4. Carbon disulfide: found in chlorinated tap water
5. Dichlorobenzene: found in mothballs and deodorizers / air fresheners
6. Ethanol: found in glass cleaners, dishwasher detergents and laundry detergents
7. Formaldehyde: found in floor lacquers and certain molded plastics (also see above)
8. Terpenes: found in fragrant products such as soap or laundry detergents
9. Toluene: found in paint
10. Xylene: found in traffic emissions and idling cars

Also, cleaning products and pesticides are some of the most toxic substances that are aerosolized.

If you are using these products in your home then you will have volatile organic compounds in the air, some of which are very toxic. Knowing these is one way of determining whether or not you have VOCs in your home. All these VOCs combined, or all the VOCs that are found in your home combined, represent the total VOC's or TVOC's.

A second way to decide whether your home may have poor indoor air quality is to look at your lifestyle and activities. Human activities can be significant sources of indoor air pollution.

Finally, look for signs of problems with the ventilation in your home. Signs that can indicate your home may not have enough ventilation include:

1. Moisture condensation on windows or walls
2. Smelly or stuffy air
3. Dirty central heating and air cooling equipment
4. And areas where books, shoes, or other items become moldy.

To clear a property as being safe we use the standard of the American Indoor Air Quality Association which suggests maximum VOC levels in an indoor air environment of 0.64 ppm or 1.47 mg/m³.

If the TVOC readings in the lab report indicate that you have less than 1.47 mg/m³, you can consider your home to be safe for occupancy. If the levels are higher than this, the negative health effects rise along with rising levels of VOC's (TVOC's).

Reducing Indoor Air Pollution and Improving Air Quality

1. Carpets are a sponge. Clean them often. Especially the part of the carpeting near the entry of the house. According to an EPA study, if you use a doormat and take shoes off at the door - common toxins are reduced by about 60%.
2. Eliminate excessive moisture, dust build-up and the use of chemical products like paint, detergents, and synthetic fibers. Side note: Say no to dry dusting! Use a damp cloth to clean up and to avoid breathing in all the dust particles which are lifted into the air while you clean.
3. Quit smoking, and prevent guests from smoking inside your house.
4. When it comes to household items, always be on the lookout for natural alternatives to chemical-laden items.
5. If you have plants at home, clean leaves regularly to get rid of dirt.
6. Take off your shoes! Shoes carry coal tar, cigarette ash, pesticides, fungal spores, lead dust, pollen, wood smoke, industrial toxins, mutagens, dust mites, and who knows what else!
7. Minimize the use of heat-producing appliances.
8. Since dry cleaning solvents can be toxic to breathe, first let dry-cleaned items air outdoors before bringing them inside in order to prevent chemicals from entering your home.
9. Know the limitation of air purifiers.
10. Clean your air conditioner to help keep asthma triggers away from your house. And as soon as you notice drips and leaks, get it fixed

Listed here are what are called “natural ways” to purify air in your home. A few are somewhat controversial and it would be good to follow up with some research into these. Increased ventilation, beeswax candles to replace paraffin candles, activated charcoal, and houseplants are well established methods.

Increase ventilation
Beeswax candles
Salt lamps
Activated Charcoal
Houseplants
Essential oils

AHAM has a portable air-cleaner certification program and lists all certified cleaners and their CADRs on its Web site at www.cadr.org. 19 AHAM's

Air cleaners can remove two types of pollutants:

1. Particles: removed by mechanical air filters such as HEPA filters
2. Gaseous: removed by charcoal filtration. Not all gaseous compounds can be removed by charcoal filtration, but most in home air pollutants can be. Carbon monoxide is one exception to this general rule. Also, ozone producing purifiers produce ozone gas, which is itself a strong irritant of respiratory tissues.

When shopping for air filters / cleaners, quality and purification ability vary greatly. One must research what is available and choose the best purifier (keeping in mind the information provided above) that fits one's budget. Air fresheners are NOT air cleaners. They contribute to VOC's and can make the indoor air allergenic and especially for young children and the elderly, may cause respiratory issues. We do not make specific recommendations. The EPA has an excellent website, with links to other resources, to help in the decision making process.

https://www.epa.gov/sites/production/files/2014-08/documents/residential_air_cleaning_devices.pdf

<https://www.epa.gov/indoor-air-quality-iaq/guide-air-cleaners-home#indoor-air>