

مجلس لبنان للأبنية الخضراء

Indoor Air Quality (IAQ)

Introduction

On average, we spend around 90% of our time indoors especially if we live and work in cities. Accordingly, the quality of our indoor living spaces has a great impact on our health and such impact could be negative, badly affecting our health as it could be positive providing us with a higher quality of life and improved productivity. This issue is getting even more pressing with nowadays tighter constructions.

It is estimated that more than 50% of all allergy, asthma and other respiratory problems are directly caused by unhealthy IAQ issues. Bad IAQ is also a major cause of some fatal diseases, it is a silent killer.

The health of building occupants and the quality of their indoor environment are very important aspects of Green Buildings.

Discussion

Indoor Air Quality including noise abatement can be best achieved by identifying the sources of potential contaminants / noise and taking the appropriate measures to remove them or minimize their impact.

Moisture

The build-up of excessive moisture inside your living space may be your home's worst enemy. Pests, dust mites, rot, and mold thrive in damp environments. The three main causes of excessive moisture are:

- **Building envelope and plumbing leaks.** These quickly cause damage to all building materials first through saturation and rot, and then through mold growth and the attraction of termites or other pests.
Avoid these problems by immediately spotting and repairing any leaks. Dry out or replace any affected building materials such as parquet flooring, wood, walls, etc... If not handled quickly, leak problems can result in severe consequences for occupant health from excessive mold growth.
Pay particular attention to external walls and stone cladding, waterproofing, flashing and caulking around roof/wall penetrations and around doors and windows, storm water drainage; plumbing, insulation of cold pipes and ducts to avoid condensation and also excessive moisture buildup in basements or attics.
- **Occupants:** We release large amounts of humidity through breathing and sweating. Also activities such as bathing, washing clothes and dishes, watering plants, cooking, etc... cause excessive moisture build-up. Reduce such effect by properly ventilating the living space.
- **Humid outdoor air.** We encounter this problem in summer in coastal areas and mid altitude western slopes of mount Lebanon while it is of much lesser importance in the dryer higher mountains and Bekaa areas. The occurrence of excessive moisture in humid areas may be due among others to lack of proper ventilation in confined spaces or to air-conditioning systems introducing humid outdoor air through leaky ducts run in the shafts or attics. Excessive humidity will turn into condensation if in contact with cold surfaces.
Air conditioning systems dehumidify the air, also dedicated dehumidifiers and proper ventilation can help somewhat in areas such as basements, storage, and wet areas, although the cause of the moisture should be addressed. Broadly, indoor living space should have relative humidity should not exceed 60%, it can be easily monitored using inexpensive relative humidity gages.

Building Materials and Furnishings

- **Building Materials:** One of the major contributors to poor indoor air quality are building materials, including some types of wood products, plastics, paints, adhesives, sealants, fillers, etc., used during construction or renovation.
Choose products carefully to minimize pollutants such as Volatile Organic Compounds (VOCs) like formaldehydes, mineral compounds like lead, asbestos and fiberglass which are all well known allergens¹, oestrogens² and carcinogens³. Synthetic paints, sealants, adhesives and insulation all potentially off-gas VOCs however low- and no-VOC emitting products are readily available (see other fact sheets). For example, Off-gassing of formaldehyde, found in the binder of many wood products, can be minimized by using materials with formaldehyde-free binders or sealing all six sides of the materials with a low-permeance sealer or paint that should be itself a low VOC emitter.
As much as possible plan your activities to use the least indoor building materials, and use products or methods that do not require synthetic adhesives (like nailing for hardwood floors, and mineral mortar for tile), or that use low VOC adhesives. Using the raw floor as the finish surface is another option, as with stained concrete floors.
Off-gassing VOC from materials may take from few months to few years depending on the curing process.
- **Furnishings:** Select furnishing products made with low VOC or mineral adhesives, carpets and furniture fabrics that can absorb VOCs emitted by other material in the same room.
- **Tips on the choice of Building Materials & Furnishing:**
 - Use formaldehyde-free insulation and building materials wherever possible.
 - Use low-VOC or water based paints.

¹ Allergy causing agent.

² Reproductive system disrupting agent.

³ Cancer causing agent.

مجلس لبنان للأبنية الخضراء

- Use low-VOC stains and finishes on all wood work.
- Use solvent-free adhesives and glues whenever possible.
- Avoid installing carpeting, they are a major source of allergies.
- Avoid installing PVC flooring.
- Avoid furniture or wood paneling made of chipboard wood.
- Check product labels for VOC concentration as % of dry weight (5% is maximum limit).
- Shop smart, the health of your family is at stake.

The way we build our homes, in terms of design and choice of materials, is one of the most significant ways that we can affect our future health.

Pests

Identification of pest problems and least toxic method of treatment to address them constitute the key components of a successful pest management plan. Preventative measures include pest-resistant building materials, clean indoor living spaces and physical pest controls such as termite barriers and properly sealed penetrations.

Carbon Monoxide

Carbon monoxide, another severe IAQ offender, is the product of incomplete combustion in automobiles, fireplaces, stoves, water heaters and boilers just to name a few. Improperly ventilated living spaces with tight external envelopes constitute increased carbon monoxide dangers to occupants. Typical prevention measures consist in using sealed combustion equipment, installing ventilation fans, proper equipment tuning and careful sealing of partitions that connect the boiler room, generator room or parking space to the living areas. Care should be taken to keep the contaminated areas under negative pressure with respect to the living spaces. Wherever possible, a portion of the exhaust from large car parks should be drawn at low level to catch the CO which is heavier than air and builds up from low level up. Carbon monoxide can be monitored with CO detectors.

Ventilation

Space ventilation is often referred to as the sleeping giant of the building industry. Most homes and offices in cold and hot climates are sealed up so tightly that the air is heated or cooled and re-circulated constantly with only the air that leaks through the envelope providing fresh air. Consequently, forced mechanical ventilation should be used to provide control over ventilation rates.

Heat recovery ventilation in large projects with conditioned spaces is a good insurance policy against build-up of indoor air problems without paying an energy penalty for direct fresh air ventilation where large amount of air is exhausted outside the building. It exhausts stale indoor air while providing fresh air with only a small energy cost. Many of these units help to pressurize the building slightly reducing infiltration and resisting external pollution intrusion. Fresh air should be properly filtered and filters should be kept clean otherwise they will be themselves the source of bad IAQ.

Natural ventilation in clean rural areas is another way to ventilate your home at no cost while filtered mechanical ventilation is required to avoid air & sound pollution in densely occupied cities.

Some Tips for proper Ventilation:

- Install properly sized and sealed HVAC unit. Indoor RH should be lower than 60 %.
- All exhaust fans (bathrooms, range hoods and clothes dryers) need to be vented outdoors.
- Residential kitchen-range hoods should not exhaust more than 350 cfm (600 m³/h).
- Bath fans should exhaust at least 50 cfm (85 m³/h).
- Install Minimum Efficiency Report Value (MERV) OF 8 or higher HVAC filters, but make sure the equipment is designed to accommodate pressure drop across the filter. Filters to be replaced or cleaned periodically.
- Protect ducts from dirt and debris until construction is completed.
- Prohibit smoking in the building except in designated smoking areas.
- Prohibit on-property smoking within 8 meters of entries, outdoor air intakes and operable windows.
- Make use of natural ventilation as possible.
- Do not install unvented fireplaces.
- Once a building is completed, operate the ventilation system or keep windows open for 4 weeks before occupancy.

Sick Building Syndrome (SBS)

The term is used to describe situations in which building occupants experience acute health and comfort effects e.g., headache; eye, nose, or throat irritation; dry cough; dry or itchy skin; dizziness and nausea; difficulty in concentrating; fatigue; and sensitivity to odors that appear to be linked to time spent in a building but no specific illness or cause can be identified.

SBS can be caused by inadequate ventilation, chemical contaminants from indoor or outdoor sources and biological contaminants as detailed in the previous sections.

This can be remedied simply by applying the preventive and corrective measures suggested above.

Green Buildings make sure you will enjoy a safe and comfortable haven in your office, your plant and with your family at home.