Top Indoor Environmental Quality (IEQ) Issues Facing Buildings

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The intent of this piece is to make readers aware of a few indoor environmental quality (IEQ) issues facing buildings. At a minimum, you should possess or pursue a general awareness of each. Some sections may be remedial for you. Others may be your first introduction to the subject. Remember, vast resources are dedicated to each listed subject, and there are many subjects worth considering that are not listed here.

IEQ Issue #1: Asbestos

Asbestos laws have changed little over the past quarter century. Violations by charter schools and by contractors who perform tenant improvements, flood restoration, and/or mold remediation are rampant.

Asbestos is most often violated by ignorance of regulations. Sometimes, however, there's a conscious risk management decision. Owners weigh the cost of being caught versus the savings of not getting caught. They ask "what are my chances of getting caught and how severe are the penalties?" If the answers are "not very often if ever" and "probably a slap on the wrist", then the firm makes an accounting decision to violate the laws, resulting in an immediate net cost savings.

However, violation of asbestos laws results in injured people. Workers, who day in and day out are being subjected to dust from demolition and renovation activities, are most at risk. They're uneducated on the subject, and generally hold positions where stopping to ask about safety may cost them their jobs.

Enforcement and education are keys to preventing asbestos related diseases. Education is lacking, as asbestos isn't considered a hot topic anymore. Although, non-profit groups such as the Indoor Air Quality Association (IAQA) and the Environmental Information Association (EIA) continually strive to get the word out.

Enforcement is a government function. Most enforcers are understaffed, under funded, and plagued with high turnover. EPA asbestos enforcement is getting more attention in several states (e.g., Arizona and Colorado). OSHA enforcement is still low in most states.

When you eat them or breathe them, asbestos fibers are bad for you. When you eat them, you can get diseases like gastrointestinal cancer. When you breathe them, you can get diseases like asbestosis, mesothelioma and lung cancer.

Many people think asbestos products were banned in the United States, but they WERE NOT! Asbestos WAS and IS used in building materials to this day. If it isn't glass, metal, or wood it might contain asbestos fibers. Pretty scary, huh?

In short, there are asbestos containing materials in a majority of buildings built prior to 1981, and in many buildings constructed after that date. Normally, when I tell people new buildings might contain asbestos, they question my intentions. I tell them not to take my word for it. Look it up, or call the local EPA or OSHA offices. Ask to speak to their asbestos enforcement group, who will happily corroborate my story.

When must you test for asbestos? Here is an oversimplification of the Federal guidelines that apply to every state:

- EPA says you must test or presume the presence of asbestos in building materials located in public buildings (all buildings except single family homes or apartments of 4 units or less) **regardless of age** if you are going to disturb

more than the threshold amounts (160 sq. ft., 260 lin. ft. and/or 35 ft^3) of suspected regulated asbestos containing material (RACM) building material.

- OSHA says regardless of the building usage (residential, commercial, etc.) you must test or presume the presence of asbestos in materials in any structure constructed prior to 1981 where people are hired to perform work where asbestos fibers might be liberated.
- Only experienced, trained, protected, AHERA certified asbestos Inspectors, Management Planners, Project Designers should test and write specifications for asbestos.
- Only experienced, trained, protected, insured, and AHERA certified asbestos contractor supervisors and workers should disturb asbestos.

Please keep in mind your state, county, air pollution control district, fire department, or city may have additional and more stringent rules. Beyond simple explanations, there are nuances of asbestos regulations that boggle the mind. So, ask an expert or become one.

IEQ Issue #2: Water, Water Everywhere

Floods happen. Roofs leak. Toilets overflow. Chiller lines burst. Condensate pans overflow. And, the list goes on. Water can present a wide range of hazards depending on where it originates, what it touches, and how long it persists.

As an example of how complicated a simple household flood can be, lets take a peek into a sewage backflow. Raw sewage can contain a wide variety of pathogens including bacteria, fungi, multi-cellular parasites, and viruses. The mere presence of sewage materials in floodwater does not necessarily guarantee that all or some of the agents of concern are present. But, testing for the presence or absence of the entire array of potential pathogens and their byproducts is impractical and interpretation of any results can be misleading. Most IEQ practitioners have chosen a position of prudence by assuming the presence of the full spectrum of pathogens and their byproducts in all floodwaters that potentially contain human-borne wastes.

The IICRC uses a three tiered categorization system that is widely recognized in the IEQ field. In essence water is placed into one of three categories.

Category 1

- Originates from a clean source
- Should be free of chemical and biological contamination
- Does not pose substantial harm to humans
- A drying option for impacted porous building materials and contents can be considered

Category 2

- Contains a degree of chemical, biological, and/or physical contamination
- May or may not pose substantial harm to humans
- Should be judged on a case by case basis
- Drying may or may not be an option for impacted porous building materials and contents can considered (carpet padding MUST be removed)

Category 3

- Is grossly unsanitary and may contain pathogenic agents &/or chemicals of concern
- Examples:
  1. Originating from beyond the sewer trap
  2. Having contacted soil
  3. Category 1 or 2 water that has degraded to Category 3 over time and/or due to field conditions
- Presumed to present substantial harm to humans and should be handled accordingly
- Drying is not an option for impacted porous building materials and contents

When responding to a flood, ask where the water originated. If no one knows, proceed as if it contains chemicals or pathogens of concern. Otherwise, you might find yourself up the proverbial fecal creek without a paddle when an employee gets hepatitis that's easily attributable to your project.

IEQ Issue #3: Mold

There's increased mold awareness, but mold still grows in buildings and still catches people by surprise. Misinformation is prevalent and people are scared. Here's a mold primer or Mold 101 that might help.

When visible fungal colonies grow indoors, they're commonly called mold. Molds are a ubiquitous, normal and important part of our indoor and outdoor environment. Airborne and settled mold spores and hyphae are commonly found indoors and outdoors. Viable mold particulate will grow into colonies when favorable conditions are met: nutrients, air, temperature, and water. Most buildings are constructed with materials suitable as nutrients for mold growth, such as wood, pressed wood, drywall paper, etc. Organic dusts are also good nutrients for many molds and most indoor spaces have areas where dust and other organic debris collects. In addition, occupied buildings contain air and are maintained at temperatures optimal for mold growth. The availability of moisture is the primary factor keeping ambient settled mold spores from amplifying or growing.

Molds in indoor environments are not regulated and have no mandated permissible exposure limits (PEL). Exposure to mold at background levels in air and accumulated on surfaces is unavoidable due to mold's ubiquity. Overexposure to mold can present a health hazard regardless of the type or color of mold. Health effects associated with mold can include: allergic reaction, irritation, infection, and/or intoxication. Mold exposure (i.e. duration, concentration, specific molds present, viability, convoluting factors, etc.) and individual susceptibility (weight, immune system health, allergy profile, etc.) determine the potential for adverse health effects.

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According to various current industry guidelines (EPA, IICRC, ACGIH, etc.) there are two factors to consider in determining a balanced or acceptable indoor environment regarding mold:

1. Visible mold growth in indoor environments is unacceptable. Visible mold growth is defined here as mold that has grown (amplification) to a degree visible to the unaided human eye in both exposed and obstructed areas.
2. Airborne fungal burden indoors should be similar to airborne fungal burden outdoors, when compared both qualitatively (same kinds) and quantitatively (similar concentrations).

IEQ Issue #4: Inadequate Outside Air

Generally it's the industry standard to bring in 15 cubic feet of outside or "fresh" air for each occupant every minute. Regardless of your take on the ASHRAE 62-2001 recommended ventilation rates being too low or too high, you would be hard pressed to successfully argue against the value of bringing in outside air. It's the quintessential "solution by dilution" control method for dealing with sources of pollution that cannot be controlled any other way. By bringing in or supplying "fresh" outside air, you are displacing and replacing the "used" air that is filled with higher concentrations of body odor, perfume, popcorn odor, flu virus, paper dust, skin cells, copier generated ozone, etc.

In a perfect world a building is designed to meet current outdoor air ventilation rates, is maintained to flawlessly deliver those rates, and is maintained at or below the designed occupant density maximums. But this is the real world. Here are a few of the many things that smash our Norman Rockwellian picture described above:

Overpopulation

- The number of people the structure was designed to house has not changed, but we are packing them in. With the advent of the cubicle, a room designed for 10 now holds 20. I can't tell you how many schools I've been in where a janitor's closet is now an office for three unlucky administrators. And, I've never heard someone say "Gee Bob, we should modify the HVAC system to accommodate the increase in population and changes in building usage."

Thermal overload

- Unless the architect was moonlighting as a fortuneteller, the design of any structure pre-1990 likely didn't consider the heat load emitted by the computer tower, monitor, printer, mini-fridge, and speakerphone at every workstation.

Dust in the Wind

- Welcome to the in-house printing revolution. Office spaces are packed with printers, copiers, faxes, and shredders. All of which are emitting undesirables such as paper dust, toner, fixing chemicals, ozone, and/or other sundry emissions.

Tenant "improvement" or TI work

- Modifications to the building to accommodate tenant needs often consider aesthetics, bathroom availability, server room temperatures, and phone distribution. Rarely does HVAC get the attention it deserves. When dicing up a tenant space you must consider the impacts to the air distribution system. If you don't, you cannot complain about the whining tenants always pining about the heat or odors in their suite.

Quick advice for preventing IEQ complaints …

- Don't use or store ridiculous stuff indoors (i.e. gasoline, methyl-ethyl-death, recyclable garbage).
- Get the outdoor ventilation rate right (rule of thumb 15 CFM. See ASHRAE for details).
- Keep the building positively pressurized to the outdoors (This puts you in control of the air infiltration pathways).
- Depressurize your kitchens, bathrooms, and garages (keep the odors and chemicals associated with these areas away from the rest of the building and you might earn employee of the month).

IEQ Issue #5: Sewer Gas Infiltration

Indoor plumbing drain systems are one of the greatest indoor environmental quality advances in history. These simple gravity flow sanitation systems rid our buildings of fluid and solid wastes that would otherwise pile up causing scourge on a medieval scale. The system is designed to accommodate and release the gasses displaced from the pipes or created by the wastes they transport. Generally these waste gasses exit the roof via sewer exhaust vents. But, they can enter the structure via a variety of pathways, where they both reek and wreak havoc.

Sewer gas can contain a huge variety of chemicals and odors. The variation in concentration varies dramatically depending on time of day/year, what's upstream, ambient temperatures, nearby line jetting, building pressures, etc. Chemicals can be at concentrations that cause adverse reactions such as nausea, irritation of mucosal membranes, headache, etc. Often symptoms are not specific to any single contaminant.

People have varied levels of olfactory sensitivity (ability to smell) and very different descriptive ability. Often odors from a sewer are mistaken for the natural gas odorant, mercaptan. This simple mistake leads to 911 calls to the fire department and building evacuations.

Here are a few pathways to keep in mind:

- Sewer gas exhausting on the roof with nearby outdoor air intakes
- Dried out drain traps in floor drains, showers, sinks, etc
- Removed plumbing fixtures with uncapped drains
- Toilets detached and reset without a new wax ring
- Using wax rings instead of neoprene rings for saddle mounted (wall mounted) toilets

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BULLETIN BOARD

Companies

Seattle-based **O Ecotextiles**, debuting in the U.S. this year, has been announced as one of BuildingGreen's 2008 Top-10 Green Building Products by the editors of Environmental Building News and GreenSpec.

O Ecotextiles' message is direct: Being an "organic textile" means not just that a fabric uses organic fibers in the yarn, but that every step of the production process has been certified eco-friendly. The company produces organic fabrics for residential and contract/hospitality design use.

"We are thrilled and gratified that the oracle of green product evaluation has spoken with us at length and determined that we are both authentic in our eco-friendly claims and worthy of support," states CEO Patty Grossman. "We at O Ecotextiles continue to find every opportunity to educate the public, not specifically about our collection necessarily, but about the impact of both the production and the end product (fabric) on both our own health and the health of the planet."

Hotels and spas looking for low maintenance, high performance and high design air purifiers have not much of choice until now, according to Steve Tilkin, Principal at **T2 Site Amenities**. Winner of many prestigious design awards, the air purifier by LightAir removes practically all airborne impurities including viruses, bacteria, dust, allergens, pet dander, pollen, and mold.

Tilkin mentioned that many hotel properties have had poor experiences with other air purifiers that required high maintenance or released ozone.

The LightAir product however, requires minimal maintenance. There are no filters to clean or replace. The housekeeping staff just cleans the metal collection cylinder when needed - usually once every 2 or 3 weeks. The LightAir product is also completely silent, energy efficient and environmentally friendly. And it doesn't look like an appliance, a key factor for many hotels and spas concerned about aesthetics.

Global Prevention Services (GPS), one of the nation's largest microbial prevention and remediation companies, has introduced the GPS Price Guaranty. As more and more Americans have become aware of the dangers associated with mold contamination in their homes and offices, the need for mold remediation services has been increasing.

GPS recommends consumers educate themselves about mold remediation techniques to ensure that they choose the most qualified company available.

The GPS Price Guaranty states: If any competitor tries to beat GPS on price, we'll match their estimate and give you a 5% incentive bonus. Competitors' quotes must detail the same project scope of work and utilize equipment, materials and treatment products equal to the choices always found in GPS estimates.

The American Institute of Architects (AIA) has offered to assist President-elect Barack Obama advance his goals of promoting green buildings and focusing on the needs of urban areas. As a key player in the last "Greening of the White House" initiative in the 1990s, the AIA has also recommended making 1600 Pennsylvania Avenue an international model of energy efficiency.

The AIA has recommended to the transition team that, due to the central role that buildings play in securing energy independence, "it is vital that a high-level advisor on green buildings be a part of the White House team to coordinate executive branch activities and to promote these issues to the public."

The Carbon Monoxide Safety Association (COSA) will be holding a Carbon Monoxide Safety Training Seminar and Certification Wednesday March 11, 2009. The session will be held at the Imperial Palace Hotel, in Las Vegas.

Join with the COSA education program addressing problems associated with furnaces, water heaters and other combustion systems commonly found in buildings, and where duct and building pressures greatly influence their safety and efficiency.

Awareness of recreational and emergency situation hazards ties the common thread to all consumers.

This community focused program draws service providers, code officials, first responders, inspectors, technicians and others into a common understanding of the foreseeable hazards associated with carbon monoxide.

The seminar is presented in distinct segments that include: carbon monoxide (CO) properties and how it is produced, measured and disseminated, and the health effects of short term as well as long term exposures.

Basic testing procedures, overview of combustion analysis, use of test instruments, a primer on how building and duct pressures effect the production and distribution of CO are also reviewed as will a close look at recreational exposures which affects us all.

Appliances that utilize natural gas and other fossil fuels have the potential to produce CO. This class will present basic manufacturer test requirements for proper installation and service verification as well as procedures to check the cleanliness and the integrity of the combustion gases for safety as well as for efficiency.

How do you know if an alarm is working or if it is accurate and the right one? When do I choose an alarm more sensitive to the health conditions of the people in my house or care? The choice of alarms, detectors and monitors may be a matter of life or death. Who is responsible for the air you breathe?

As a sponsor of the National HVACR Training Conference, COSA will provide attendees of the Carbon Monoxide Safety Training and Certification with admission to both conferences for one low fee. Pay $250.00 for this seminar and attend the entire National Educators and Trainer's Conference for Free.

Schedule: March 8 Registration & Vendor Show, March 9 Conference & CMHE Testing, March 10 Conference & CMHE Testing, March 11 Carbon Monoxide Safety Training and Certification.

Northeast Laboratory Services (NEL), the leader in providing Accredited Analytical Services to the IAQ, Food, Environmental, and Pharmaceutical Industries, is announcing their expansion and opening of a new analytical testing facility in Portland, Maine.

The Portland, Maine facility complements the current location in Winslow, Maine, which has been in operation since the early 1970's. NEL is the only laboratory in New England accredited by A2LA in the Biological Field of Testing, is NELAC and AIHA Accredited, and holds an FDA Registered Media Manufacturing License. NEL also holds an array of certifications from state and federal regulating agencies.

Nationally recognized as a provider of analytical services and custom media for the dairy, bottled water, food, IAQ, engineering, and pharmaceutical industries, NEL's Portland location will soon provide analytical services to these industries, including on-site radon and asbestos testing.

"This new Portland location will allow us to provide the personal contact and customer convenience we strive for in every aspect of our business. No other laboratory can offer the array of accredited services we provide, and the opening of this new location is testament to our continued dedication and commitment to exceeding our customers' expectations," reports Rodney "Beau" Mears, President and CEO of NEL.

The Portland, Maine laboratory is located at 999 Forest Avenue, began operations on Monday November 10, 2008, and can be reached at (207)878-6481.

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IEQ Issue #6: Occupant Activities

Activities of occupants, both personal and professional, can also dramatically impact IEQ. Here are a few of the countless examples:

- Blocking HVAC vents because they're too cold, thereby throwing off the system balance for distribution and collection of air
- Putting a lamp near the wall hung thermostat, artificially heating the thermostat and resulting in an air conditioner that never shuts off and a heater that never turns on
- Leaving a bag of oranges between their cubicles for six months
- Playing gastrointestinal Russian roulette by leaving food out for days at a time in the name of "pot-luck" lunches
- Dumping coffee daily into potted fake plants

IEQ Issue #7: Nuisance Birds

Nuisance birds, such as pigeons, starlings, and crows, can threaten human health and safety, as well as your wallet. Nuisance birds thrive in our urban settings. Roosting and nesting opportunities abound. Food sources are abundant. And, there are plenty of nooks and crannies that are inaccessible to predators. All those birds mean a lot of bird related stuff such as droppings, feathers, carcasses, and nesting materials. All that bird related stuff can lead to:

Roof Collapse:

- Accumulations of carcasses, nests, or feces block roof drains and scuppers causing rainwater accumulation and creating a brief rooftop swimming pool. Ultimately the roof collapses and all the pooled water and pigeon goo becomes an indoor water feature.

Loss of Ventilation Systems Efficiency and Increased Maintenance:

- Outdoor air intakes get blocked reducing our solution by dilution capabilities.
- Filters become blocked and require more energy expenditure to "pass gas". This leads to increases in both electricity and maintenance costs, not to mention promoting leakage and filter collapse.
- Carbon monoxide poisoning can result with airflow blockages.

Increased Fire Hazard:

- Nests on or within lighted signs or other electrical equipment can start fires.

Corrosion:

- Acidic bird droppings can eat away at construction materials and finishes. The chemical reactions related to bird feces have even been implicated in bridge collapse.

Infection:

- The 50 plus bird-associated diseases read like a fourth year Latin lesson.
- The routes of exposure such as: food and water becoming contaminated with feces, inhalation of contaminated dust, transference of germs by parasites, and hand to mouth transfer of dust can lead to bacterial, viral, mycotic, and protozoal infections.

IEQ Issue #8: Other

There is really no way to quantify the top ten IEQ issues. When an issue occurs in your building it's always the #1 issue. Here is a list of a few of the candidates for IEQ Issue #8:

- Carbon Monoxide (CO)
- Radon
- Formaldehyde (HCOH)
- Sick Building Syndrome (SBS)
- Volatile Organic Chemicals (VOCs)
- Lead Based Paint (LBP)
- Environmental Tobacco Smoke (ETS)
- Mysterious Odors
- Clandestine Drug Labs (Methamphetamine, LSD, Ecstasy)
- Trauma Scenes
- Etc.

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