IAQ101: What People Don't Know About IAQ (But Can Learn From Us)
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How much air do we have?
Does this office have an IAQ problem?

• Tenants report
  • Odors
  • Feel sick
  • “Not right”

• What do you do if you are called in professionally?
Since the 50’s

- Carpets, wallboard
- Particleboard, finishes, glues, foam insulation
- Computers, printers, copiers (toner)
- Cleaning, personal care, pesticide chemicals
- No openable windows
What Is It?

• Secondhand Smoke!

• Adults - lung cancer

• Children – asthma, bronchitis, pneumonia, ear infections, SIDS
What Is It?

• Radon!
• 2nd leading cause of lung cancer
• 21,000 deaths yearly
• Prevent: $500-$2500
• TEST YOUR HOME!
• Fix only w/ certified
What Is It?

• Carbon Monoxide

• “Head” symptoms: dizzy, nausea, headache, tired, confused, flu-like

• Failed combustion gear, emergency power generators, tailpipes
What Are They?

- Volatile Organic Chemicals (VOCs)
- Headaches, rash, respiratory
- “Wet” building products, pesticides, pressed wood (formaldehyde), cleaners
What Are These?

• Biological contaminants
  • Cat dander
  • Pollen
  • Roach or rat droppings
  • Dust mite droppings
  • Mold

• Allergy, irritation, etc.
Health Effects from Biologicals

- Infections
  - Contagious (colds, flu, TB, measles)
  - Enviro-source (Legionella, Histoplasmosis, aspergillosis)
- Toxicoses (mycotoxins, endotoxins)
- Hypersensitivity Diseases
  - Allergy, asthma, Hypersensitivity Pneumonitis (HP)
Legionella

• Not just cooling towers
• Fountain, DHW line/shower, mist machine, humidifier, spa, others
• Grows at 70-110 F
• ASHRAE Standard 188-18
• Legionella is PREVENTABLE
  • Work practices should reflect guidance
EPA on Molds

- Popular guidance
- NO REGULATIONS
- Health Effects in Appendix B
Big Ideas about Molds

• Mold = MOISTURE. Get rid of both!
• Sample only for legal reasons, to find hidden mold, or if results changes M.D.’s treatment
• No Federal mold standards
• No Federal regulations for cleanups
• Biocides not recommended routinely
Sampling = Snapshot

- Air sampling provides information only for the time of sampling
- Experience in interpretation of results is essential
Guidelines for Remediating Mold Growth Caused by Clean Water

• Table 2, Page 14: EPA divides into
  • Small ( < 10 square feet)
  • Medium (10-100 square feet)
  • Large (>100 square feet)

• Cleanup, protective equipment, and containment vary with size
What We Didn’t Cover

- Lead-based paint
- Asbestos
- Sewer Gases
- Pesticides
- CO2
Outside Air affects IAQ
What Else?

• Physical factors
  • noise
  • lighting
  • vibration
  • temperature

• Mental factors – trust, psychosocial
Finding IAQ Problems

• Talk to occupants (esp. maintenance)

• Visual Assessment
  • IAQ “walk through”

• Then fix problems!

• Testing may be ineffective
  • May not identify sources, health concern
Visual Inspection

• Often not complicated
On the roof
Visual Inspection Tools

- Thermometer, RH meter
- Ruler, flashlight, screwdriver, knife
- Moisture meter
- Smoke, feather or micromanometer
What can we do for indoor air?

• **CONTROL** pollution sources
  - If inside, cover it or replace it
  - If outside, don’t bring it in!

• **VENTILATE** to remove/dilute pollutants

• **CLEAN** the air, whether recirculated or “fresh”
Source Control I – Keep It Out!

- Use low-emitting materials: paints, adhesives, carpets, wood products
- Use Green Cleaners – fewer VOCs/odors
- No Smoking!
- Seal ductwork, garage connections, etc.
- Trap dirt at doors (walk-off mats)
- Integrated Pest Management – less $, chem
Source Control II – If in, control!

• Cover stinky stuff – cap chemicals, wrap smelly stuff
• Use HEPA vacuum cleaners, floor buffers to capture particles
• Capture or exhaust dust or fumes from any other activities (hobbies, cooking)
Controlling Mold

• Moisture Control KEY to Mold Control

• Use of antimicrobials (like bleach) not recommended routinely

• You see mold, it’s there. Do you need to sample?

• Solve the moisture, then remove moldy material. Discard moldy porous items.
Ventilation

• Check HVAC operation, especially outside air – may not be working
• Are exhausts working? Add exhaust?
• Exhaust dirtiest air? Dilute with outside air?
• Increase OA flow?
Find outside air intakes

• Are they working?
• Is there damage? Change?
• Is a possible source nearby?
Cost of office ventilation

- Class A office space may be $15-20/sf/year
- Utility bills are $1-2/sf/yr
- HVAC is $0.40-$1/sf/yr
- Outdoor air is $0.05-15/sf/yr
- Office salaries: $200-$300/sf/yr
- 1% change in productivity: $2-3/sf/yr
  $2 >> $0.15
Clean or filter the air

• Filters – Min. Efficiency Rating Value (MERV)
  • Office, EPA recommends MERV 8+
  • Homes, EPA -> MERV 6+

• Higher MERV: more $, more energy, less dirt in the air and lungs

• “Air purifiers” can help but not a full solution
Ozone not “air cleaner”

• Ozone = lung irritant, regulated outdoors
• O3 reacts quickly with some chemicals and can double VOC levels
• Other chem reactions take weeks+
• “New miracle technology” may produce O3
  • [www.epa.gov/iaq/pdfs/ozone_generator.pdf](http://www.epa.gov/iaq/pdfs/ozone_generator.pdf)
Exposure Control

• Move people away from the problem
• For a day, or nightly, or more
• Temporary (vacation) or permanent
For all solutions, communicate!

• Let occupants know you acted
• Be sure they understand what you’re doing to fix the identified problem
• Always follow through. Build trust
Future of Indoor Air

• Per LBNL, worst pollutant PM 2.5, then tobacco smoke, radon, and formaldehyde
• **Particulate Matter 2.5** affects cardiovascular (elderly), unborn, babies + it’s measurable
• “Citizen Science” (wearable monitors) will drive news media
• **Legionella**: headlines and PREVENTABLE
Stories (if time)

• Odor in lobby by coffee shop

• Unplanned filtration

• Chicken restaurant
Conclusions

• Air is a slender layer over us
• Visual inspection is fastest way to solve problems
• For solutions, think
  • Source Control
  • Ventilation
  • Air Cleaning
  • Exposure Control
Bibliography

• www.epa.gov/iaq
Questions?

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