

CIVE 3331

Indoor Air Quality

Despite regulatory and “public perception” emphasis on outdoor air quality, indoor air quality is at least as important, if not more important.

Typical working model of how pollutants affect receptors is:

Transport

Source -----> Receptor

Since receptors spend over 1/2 their time indoors, indoor air quality is critical. The outdoor air quality represents the background quality (if air indoors is refreshed rapidly, it should approach the quality of outdoor air)

Indoor pollutants usually arise from building materials, and how the HVAC system is designed and operated. Energy cost savings often defeats well designed systems because of reduced outside air mixing. Indoor pollution has made people ill and has killed people.

Sick-building syndrome – allergy like symptoms from occupancy of particular buildings. Various suspected causes: mold in walls and HVAC system. CO build-up. Off-gas from construction materials. Etc.

Some pollutants include:

- Asbestos and other fibers
- Carbon Monoxide
- Formaldehyde
- Particulates
- Nitrogen Dioxide
- Ozone
- Radon
- Sulfur dioxide
- VOC

Special pollutants:

Environmental Tobacco Smoke (ETS). Usual pollutants in smoke, but exposure is involuntary.

Asbestos

Radon – carcinogen Varies geographically

Carbon Monoxide – blood poison, competes with O₂.

Allergens – irritate and stimulate immune system. Lead to asthma, infections, increased morbidity (illness) and premature mortality (death). Some molds are very toxic, they are relatively common. Emerging area of air quality research.

Principal mechanism of controlling indoor air quality is by dilution with outside air (hence the need to have outside air quality).

Infiltration – air exchange through cracks and holes in the building envelope.

Wind driven – dilutes pollutants

Stack driven – concentrates pollutants

Natural ventilation – windows, doors, vents.

Forced ventilation – blowers. Most office buildings have fixed windows for various reasons (structural integrity, security, energy management) and use forced ventilation exclusively. Energy conservation favors internal recycling to reduce cost to heat/cool humidify/dehumidify outside air, but allows pollutants to concentrate.

<Scan and append handwritten notes>