

# Indoor Air Quality

# Standards/Guidance

- OSHA PEL's – usually not applicable
- U.S. EPA and NIOSH – Building Air Quality
- ASHRAE – Indoor Air Quality Guide
- ACGIH – Indoor Air Quality

# Sick Building Syndrome

- Headache
- Nausea
- Dizziness
- Dermatitis
- Eyes, nose, throat and respirator irritation
- Coughing
- Difficulty concentrating
- Sensitivity to odors
- Muscle pain
- Fatigue

# Building-Related Illnesses

- Are those for which there is a clinically defined illness of known etiology and includes infections such as:
  - Legionellosis
  - Allergic reaction such as hypersensitivity diseases and are often documented by physical signs and laboratory findings.

# NIOSH

- A NIOSH study of 500 indoor air quality investigations found that the primary sources of indoor air quality problems are:
  - 1) Inadequate ventilation – 52%
  - 2) Contamination from inside building – 16%
  - 3) Microbial contamination – 5%
  - 4) Contamination from building fabric – 4%
  - 5) Unknown sources – 13%

# Major Indoor Air Contaminants

- Acetic Acid
- Carbon Dioxide
- Carbon Monoxide
- Formaldehyde
- Nitrogen Oxide
- Miscellaneous Inorganic Gases – (ammonia, hydrogen sulfide, sulfur dioxide)
- Ozone
- Volatile Organic Compounds
- Synthetic Fibers
- Tobacco Smoke
- Microorganisms and Other Biological Contaminants.

# Investigation - Employer Interview

- Magnitude and distribution of employee complaint or illness?
- Are they aware of any employees obtaining medical care?
- What are the design and operational parameters of the (HVAC) system?
  - source and amount of fresh air per occupant
  - adjustable or local HVAC controls
  - type of humidifier and how controlled
  - recent ventilation changes;
  - And areas serviced recently
- Frequency and type of maintenance performed
- Review ventilation –air intake by loading dock or smoking area

# Investigation - Employer

- What type of equipment used in area
  - Copiers, blue print machines or other equipment
- Has there been any recent renovations or maintenance
  - Painting
  - Carpet cleaning
  - Use of acid drain cleaner
  - Disinfecting of HVAC system
  - Carpet installation
  - Air conditioning repair
  - Pesticide application
  - Roofing
- Air flow pattern changes
  - Installation of partitions
  - Relocation of air intakes or exhausts?

# Investigation – Employee Interview

- What are the complaints and associated symptoms experienced
  - When do they occur (season, time, days, frequency)
  - Where do they occur
  - How long do the symptoms last
  - Do they clear up after leaving work (how soon)
  - Have the symptoms been triggered by any specific event or in a specific area.
  - Was any medical diagnosis or care rendered?

# Employee Interview

- Workers' Characteristics
  - Smoker
  - Allergies
  - Pre-existing illness and disabilities
  - Are they taking any medication
  - What do they believe are the occupational contributors

# Ventilation Evaluation

- Is the ventilation system programmable
- When does the ventilation turn on/turn off
- How often are filters changed/Type of Filters
- Are the ducts lined on the inside or outside
- Are the cooling drains working
- Has there been any modifications to building or ventilation
- Intake locations

## – Indoor Air Quality Meter

- Carbon Monoxide
- Carbon Dioxide
- Relative Humidity
- Temperature



# Mold Sampling

- If you can see it, do not sample. I do not care what type it is.
- Sampling Methods
  - Air-O-Cell with Zeflon Sampler
  - Agar with Anderson Sampler



# Mold Testing

- Locations to take samples
  - Area of concern
  - Area with no complaint (Control)
  - Outside air samples – note flow rate should be less for outside sample
- Evaluation of samples
  - Types of mold identifies (species)/quantity
  - Compare (Inside vs. Control vs. Outside)
    - Quantity
    - Species
    - % species in sample

# Case Study

- Employee complained of possible mold exposure.
  - Employee filed CA-2
  - PL stated no one else was having issues.
  - PL stated bathroom had over-flowed several times in past year.
  - PL stated grey water was vacuumed up with wet vacuum but carpet was not cleaned.
  - PL stated most of the water drained into sub-basement under floor

# Sampling Equipment

- Zeflon Pump with Air-O-Cell
- TSI, IAQ Meter 8760
- Anderson Sample with filter for bulk sampling

# Observations

- Visitor Center –
  - Supported by two HVAC units
  - Supply and Return duct lined with insulation
  - Supply duct is in overhead – Dirty vents
  - Return Duct sub-basement
  - Both units inspected and operating correctly.
  - Sensor installed in one bathroom to detect water over-flow.
  - Visitor Center side created into office space.

# Observations

- Carpet needed cleaning – cleaned 3 years ago
- No visible mold observed.
- Sub-Basement has rock flooring.

# Investigation Results

- See Report

# Chemicals

- Detector Tubes
  - Formaldehyde, carbon dioxide, carbon monoxide, VOC's
- Passive Dosimeters
- PID Meter
- Whole air sampling – Tedlar Bag, Summa Canister