

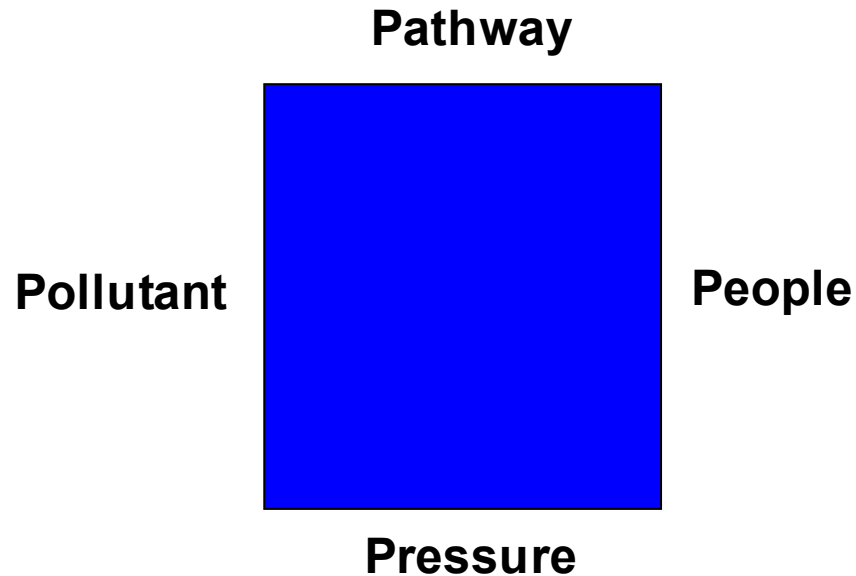
What is Indoor Air Quality?

Good IAQ?



Assessing and Investigating IAQ

Four Components of a Complete Air Contaminant Migration Pathway



People in Buildings



Pollutants – Outdoor Sources

- Industry
- Traffic
- Landfill
- Wastewater treatment
- Dry cleaners
- Chemical spills



Pollutants – Indoor Sources

- Stored Chemicals
 - Garages, cleaning, heating oil, pesticides
- Combustion
 - Heaters, hot water, stoves, fires
- Building materials, Furnishings
- Cooking, Smoking



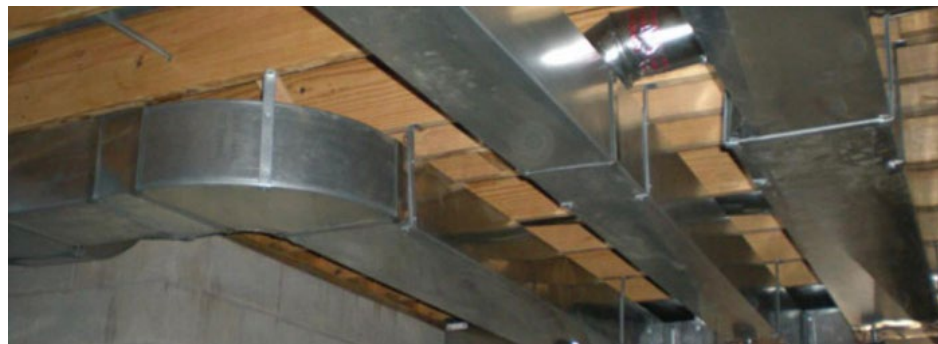
Pollutants – Odors and Bioeffluents

- Air ‘Fresheners’
- Plants
- Perfumes and colognes
- Food
- The Lunchtime Workout...



Pathways

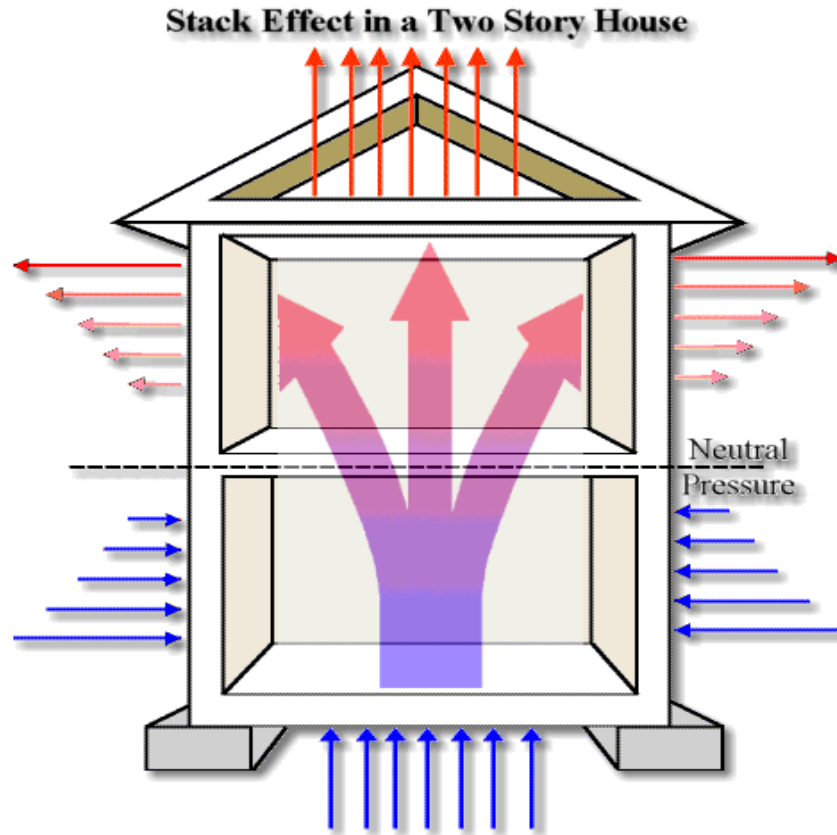
- Ducts
- Windows
- Doors
- Drains
- Penetrations
- Containment
- Containers



Pathways in Buildings

- Ducts
- Stairwells
- Elevator Shaft
- Drop ceilings
 - Open Plenum
- Utility chases
- Block walls
- Stud walls
- Always Open?
 - Dampers and flaps
- Seasonal?
 - Windows
 - Doors
- Maintenance?
 - Drain traps

Pressures in Buildings



Ventilation

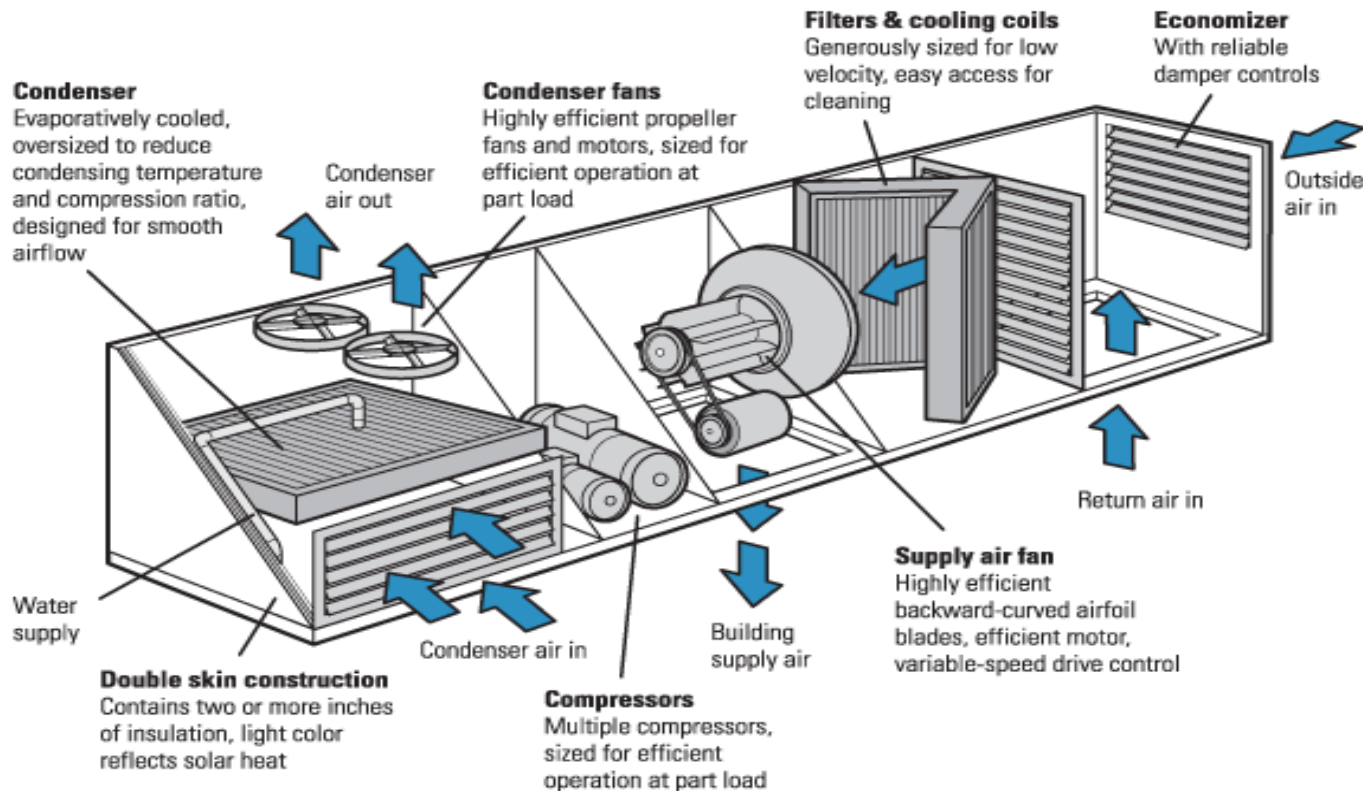
Heating, Ventilating and Air Conditioning (HVAC) Systems

- **Air Handling Unit**
 - Provides filtration, temperature control, and distributes the air
- **Outdoor Air Intake or Make-up Air Return**
 - This air replaces indoor air as it is exhausted from the building
- **Duct work**
 - Directs conditioned air in the building

Roof Top HVAC



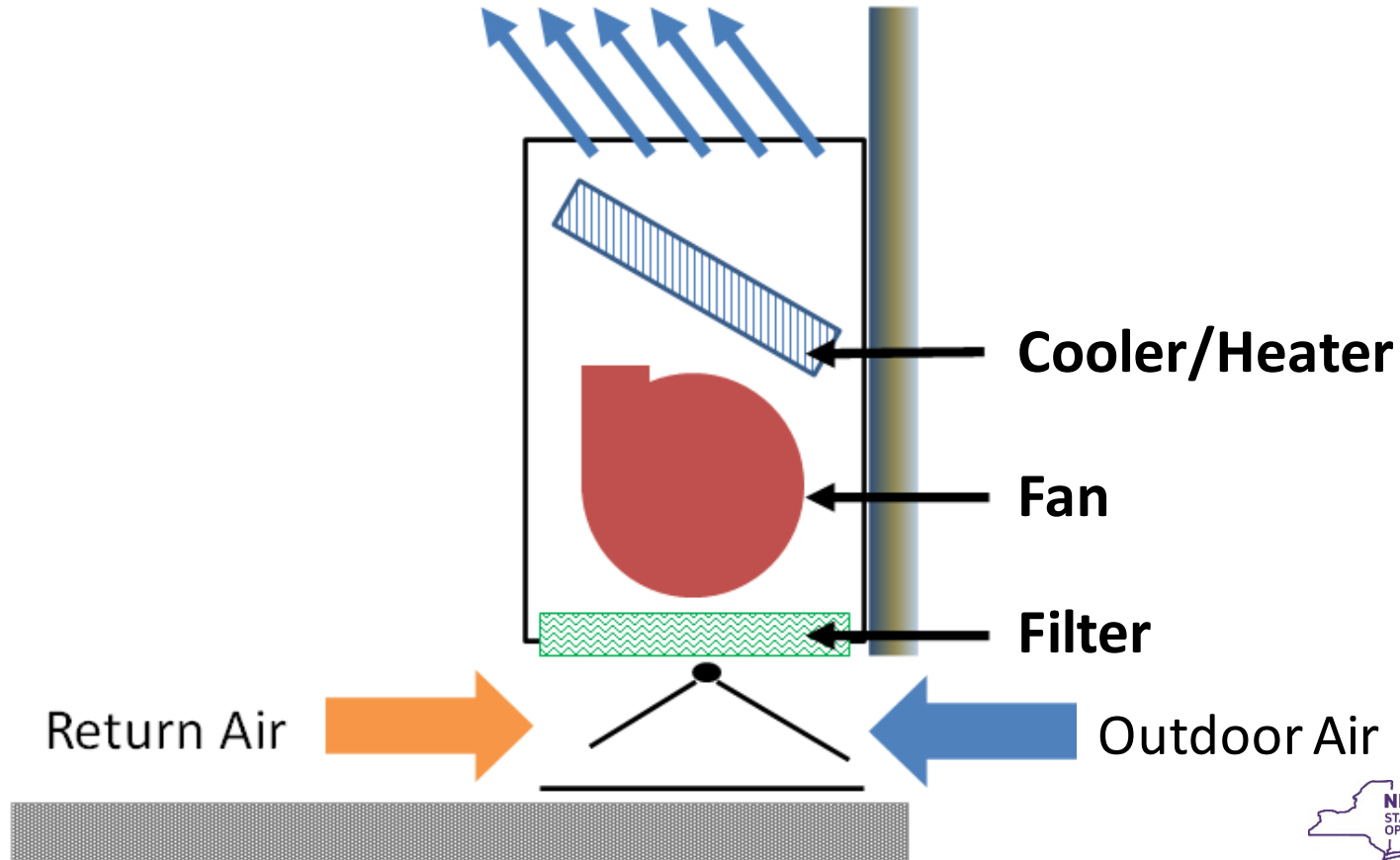
Roof Top Units



Courtesy: E source

Unit Ventilators





Portable Air Cleaners

Portable air cleaners may supplement other measures to decrease the risk of infectious bioaerosols

- They may reduce, but may not eliminate, particles, viruses, and/or microbes in the air
- The use of portable filtration devices does not decrease the need for mask wearing, physical distancing, sanitation practices, or adequate ventilation

Particularly relevant for:

- rooms without natural ventilation (openable windows),
- for higher risk environments (e.g. nurses' station, isolation rooms),
- can be considered for any other areas where there is heightened concern



Measuring IAQ

“Is the air safe to breathe?”



Observations

SEE

- Visible Stain

TOUCH

- Is it still wet?

SMELL

- Does it smell?

LISTEN

- When did it occur?



Welcome to the Teachers' Lounge!



Roof Leaks



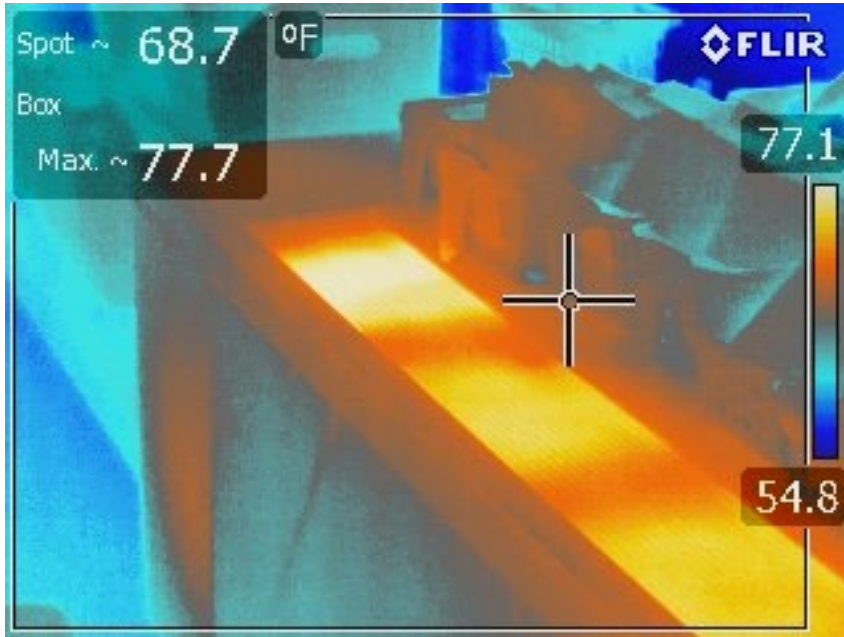
Air Cleaners and Filters



Over-stocked with Supplies?



Thermal Imaging





Measurements

We Usually Don't Measure

- Odors
- Viruses
- Bacteria
 - Except Legionella
- Pests
 - Mice, cockroaches, bedbugs, etc.
- Wood Smoke
- Environmental Tobacco Smoke (ETS)

We Can Measure

- Temperature
- Relative humidity
- Carbon dioxide
- Carbon monoxide
- VOCs
- Moisture content
- PM10, PM2.5, particulates
- Asbestos

Mold and Health

Why are we talking about mold?

- Mold is the HOT topic
 - Everyone's an Expert
- Mold is NOT a regulated contaminant
 - Same as for rodents, insects, viruses, etc.
- Mold is a symptom of water problems
- Water problems can be solved

Mold Growth

Mold Food in Buildings

- Wood
 - Boards
 - Plywood
 - OSB
 - MDF
 - Paper
- Sheetrock
 - Paper on a “sponge”
- Other organic materials
 - Glue
 - Carpet pad
 - Ceiling tile



Factors Affecting Mold Growth

- Food
- Oxygen
- Temperature
- Mold Spores
- **Water**

Control the water to control mold

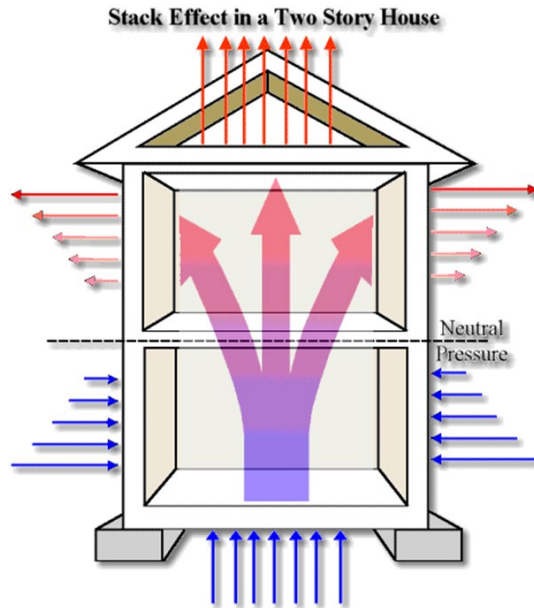


Forms of Water

- Vapor
 - Steam, humidity
- Liquid
 - Water, rain, fog
- Solid
 - Ice, snow, frost
- Adsorbed



Stack Effect



- Air gets warm and rises inside buildings
- Air pressure decreases at the lower level
- Air pressure increases at the upper level
- Air enters the lower level and exhausts at the upper level
- **Buildings 'Suck'**

Cold Surfaces



What's happening in this room?



Materials get wet in stages

- Adsorbed Water
 - Water is bound to the material
- Free Water
 - Water in capillary pores is available to mold
 - ‘Water Activity’ limits mold growth
- Saturated
 - Pores full and free water is on the material’s surface
 - Usually visible dampness and water beads

Dry materials in stages

- Visible, tangible water and dampness
 - Drain, mop and wipe up water
- Free water in pores
 - Evaporate with air movement
 - Fresh air IN – Damp air OUT
- Adsorbed water
 - Avoid over-drying to prevent cracks and warping

Investigating and Removing Mold



Mold Licensing

Article 32 New York State Labor Law

- **Training:** Contractors must obtain appropriate training prior to being licensed to perform mold assessment, remediation or abatement services.
- **Licensing:** Contractors will not be allowed to advertise or perform covered work without the required license
 - limited exceptions such as: home or business owners performing work on their own properties.
- **Minimum Work Standards:** The Mold Program also establishes new minimum work standards for mold assessments and remediation activities by licensed professionals
- <https://labor.ny.gov/workerprotection/safetyhealth/mold/mold-program.shtm>

Investigating Water and Mold

- Eyes, Nose, Touch
 - Visible mold
 - Odors
 - Current or historical water damage/stains
 - Damp and/or wet materials

Almost ***Never Need Sampling and Analysis***

Visual Inspection



Odor Evaluation



- Microbial Volatile Organic Compounds
- Musty, earthy odors
- Odors can cause health symptoms

You've Got Mold!

- 1. Fix the water problem***
2. Dry or dispose of wet material
3. Clean
4. Disinfect if necessary

Exterior Water Problems

- Grading and Drainage
- Foundations
- Building Envelope
 - Walls
 - Roofs
 - Windows and Doors

Interior Water Problems

- Ventilation
 - Attics, Crawlspace
 - Bathrooms, Kitchens
 - Exhaust systems
- Plumbing and Sanitary systems
- Bathtubs and Toilets

Drying

Allow plenty of time!

- Drain, mop and wipe off water
- Evaporate moisture with air movement
- Fresh air IN
- Damp air OUT



Cleaning

- Discard materials that can't be cleaned
 - Carpets, sheetrock, clothing, paper?
- Soap and Water
- Rinse and Repeat



Disinfection

- Generally disinfect locations with persistent water or moisture problems
- Bleach Water Solution
 - About 1 cup bleach in 1 gallon water (1:16)
 - Cheap and effective
- Specialty chemicals and procedures

In Conclusion

- Mold Indicates Water
- Water Indicates Building Problem
- Building Problems can be solved

