Energy CLASS Prize – Indoor Air Quality (IAQ)

Module 3 –Air Moving Equipment & Hazard Mitigation

December 5, 2023

Paul H. Raymer

Paul H. Raymer is a Senior Advisor in Building Science with ICF and brings more than forty-five years of building science experience to the Energy CLASS Prize. He holds numerous BPI certifications and is a certified HERS Rater, IREC assessor, HARCA Board Member, full member of ASHRAE including being a voting member of the 62.2 SSPC, and a member of the AIVC Industry Advisory Committee. He is the heating and cooling sub-committee chair for NREL's Standard Work Specifications.

Overview of the Indoor Air Quality Course

- November 28, 2023 – IAQ Terminology & Safety, Liability & Occupant Input
- November 30, 2023 –Surveying the Building & Quantitative IAQ Measurement
- December 5, 2023 –Air Moving Equipment & Hazard Mitigation
- December 7, 2023 – Identifying Interventions & Communication
- December 12, 2023 – IAQ Cohort

Agenda – December 5, 2023

Part 1 - Air Movement Equipment

- Value the benefits of ventilation
- Evaluate & inventory existing mechanical ventilation systems
- Identify sources of mechanical air movement
- Know the value of determining airflow
- Maintenance

Part 2 - Justify & Prioritize Hazards

- Develop a knowledge-based systematic approach to IAQ
- Identify existing assets
- Design standard operating procedures
- Empower an IAQ leader
- Build an effective team
- Create champions
- Secure senior buy-in

Impact of Air Movement on Source Control

IDENTIFY THE SOURCES OF BAD IAQ.

REMOVE THE SOURCES OF BAD IAQ.

VENTILATE THE REMAINDER.

Airflow

- Airflow is commonly measured in Cubic Feet per Minute (CFM) – the volume of air moved.
- Feet Per Minute (FPM) is a measurement of the velocity of the air movement. Many common testing tools provide an FPM reading.
- Infiltration is unintentional airflow into the building.
- Exfiltration is unintentional airflow out of the building.
- Pressure differences or Delta P (ΔP) is the force that drives the unintentional flows.
- ΔP also drives the desirable flows of combustion gases up passively vented chimneys.

Keep it Ventilated

Ventilation is needed to reduce exposure to:

- Airborne molds & pollens;
- Allergens;
- Carbon dioxide;
- Carbon monoxide;
- Environmental tobacco smoke;
- Moisture;
- Nitrogen dioxide;
- Particulate matter;
- Volatile organic compounds (VOCs).

Courtesy of Big Ass Fans

Keep it Ventilated

1. Natural or passive ventilation.
2. Mechanical ventilation.

Supplying acceptable quantities of outdoor air to occupied spaces is a critical component of good IAQ. Yet nearly all school ventilation systems cannot indicate whether outdoor air is even being supplied to the school, much less gauge the quantity of that air. Virtually all existing school ventilation systems rely upon a fixed damper to regulate the amount of outdoor air.

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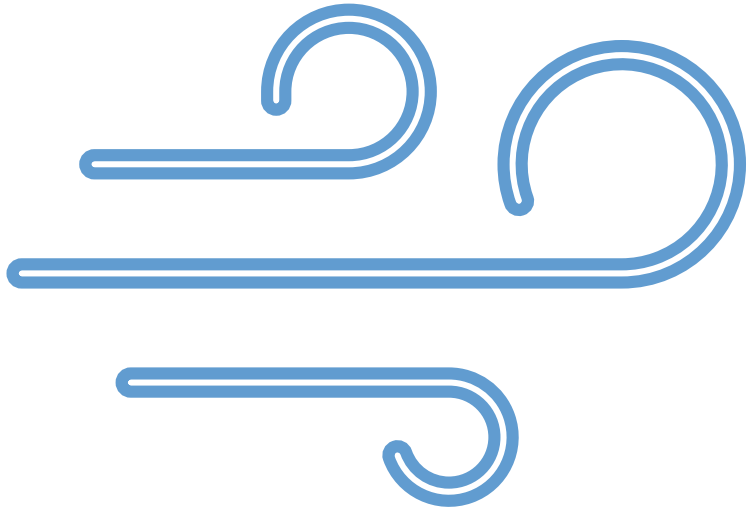
Natural or Passive Air Movement

- Building pressures
- Stack effect
  - Building
  - Combustion appliances
- Infiltration and exfiltration



Natural or Passive Air Movement

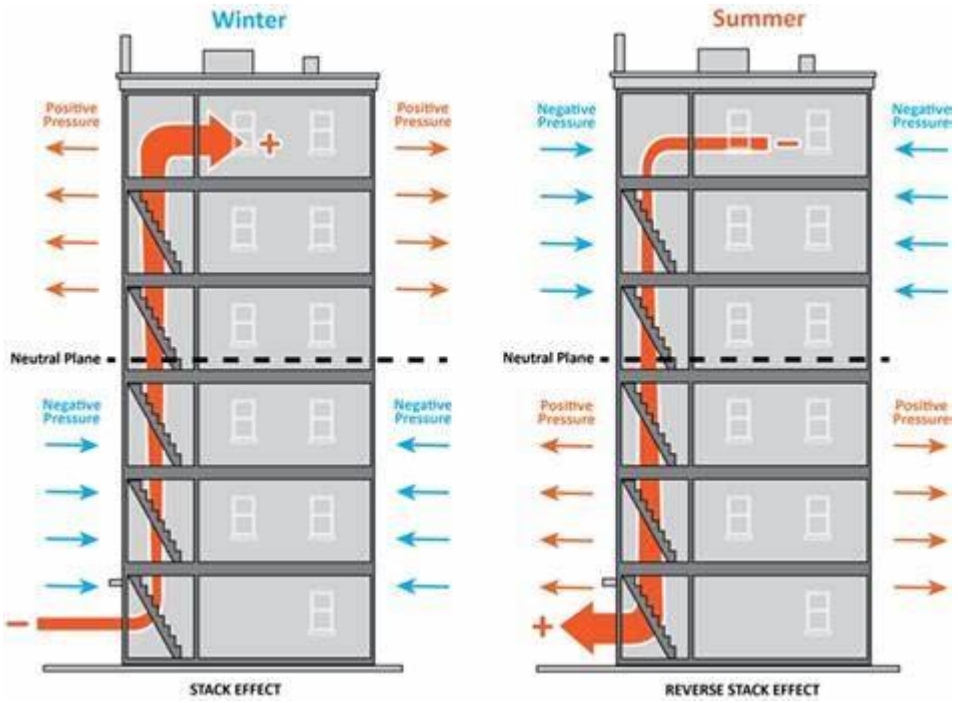
- **Designers should consider the use of natural ventilation and operable windows to supplement mechanical ventilation.** Consider outdoor sources of pollutants (including building exhausts and vehicle traffic) and noise when determining if and where to provide operable windows.

Courtesy of Heyoka Solutions

Fundamentals - Convection

Stack effect

Stack effect is a passive air moving source.



Fire Dynamics Training/CA

One cubic foot in = one cubic foot out.

Passive Ventilation

Ventilation – A Text Book To The Practice of the Art of Ventilating Buildings by William Paton Buchan 1891

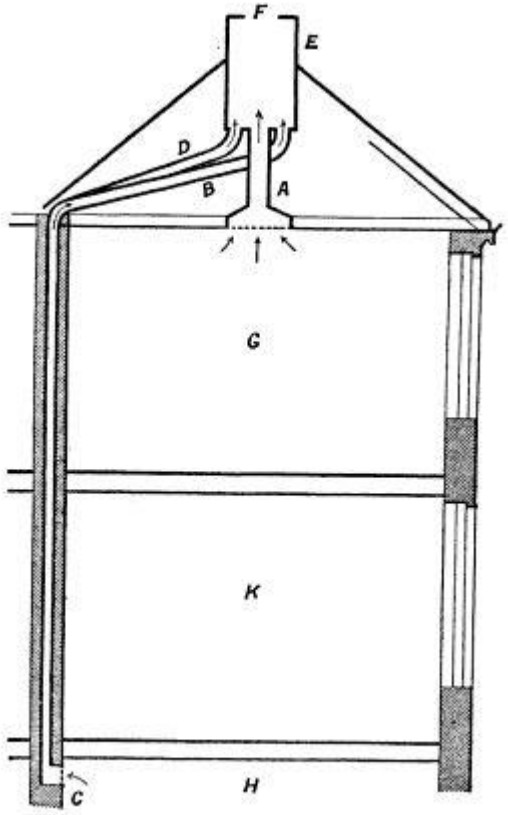


Fig. 138.

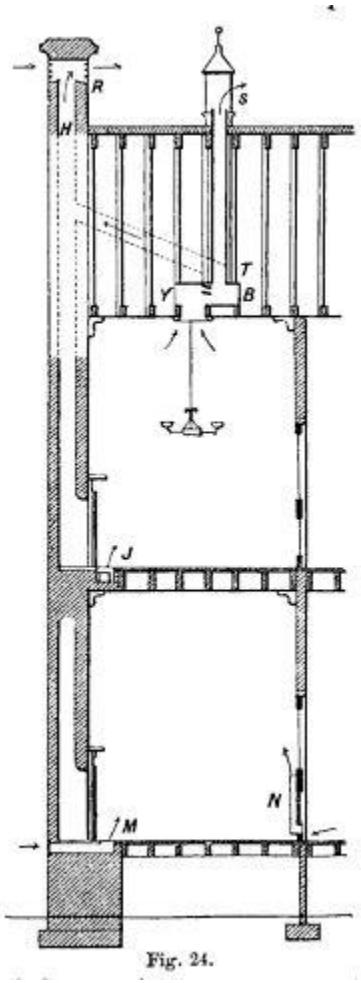


Fig. 24.

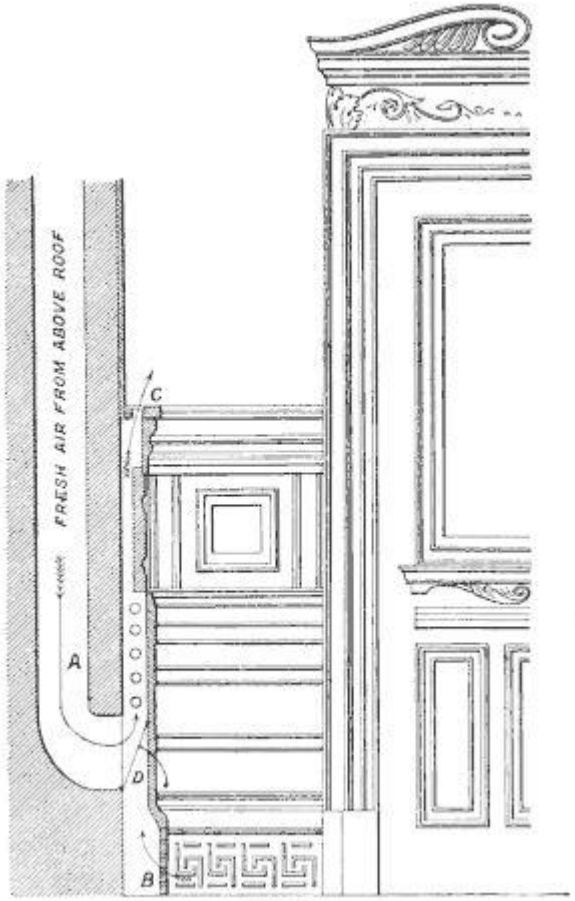


Fig. 31.

Airflow – Passive Flow

- **If operable windows will be used to supplement the HVAC system, ensure that:**
  - Openings for outdoor air are located between 3-6 feet from the floor (head height);
  - Windows are adjustable and can close tightly and securely; and
  - Windows are placed to take maximum advantage of wind direction, with openings on opposite sides of the building to maximize cross-ventilation.

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Mechanical Air Movement

Mechanical systems require power

Fan efficiency

- Start with an efficient fan
- Join it with an efficient delivery system
- Run the system efficiently
  - **Average** air change rates are not the same as **effective** air change rates.
  - Improved **effective** air change rates are achieve low and long flows.
  - Energy efficiency is improved when the fan is not cycling on and off.

Mechanical Air Movement

- Small fans commonly move 50 to 150 cfm and are used to ventilate bathrooms and closets.
- Quiet enough to be used regularly. (Sound ratings are in sones. 1 sone is approximately equal to a quiet refrigerator in a quiet kitchen.)
- Ducting runs all the way to the outside of the building.
- Termination fitting backdraft damper must be functional.

All images courtesy of Heyoka Solutions

Mechanical Air Movement

Overheated schools is an IAQ issue. These small portable devices exchange air with the outside. Some of them will be balanced and not impact the pressure in the room.

Walmart

Mechanical Air Movement

How much airflow?

At least 15 cubic feet of air per minute (cfm) of outside air must be provided for each occupant.

A typical 30-person classroom would require 15 x 30 or 450 cfm of outside air.

ASHRAE 62.1-2022

In spaces where the number of occupants is highly variable such as gyms, auditoriums and multipurpose spaces, demand-controlled ventilation (DCV) systems can be used to vary the quantity of outside air ventilation in these spaces in response to the number of occupants. One technique for doing this is to install carbon dioxide (CO_2) sensors that measure concentrations and vary the volume of outside air accordingly.

Mechanical Air Movement

- Provide exhaust ventilation for janitor's closets.
- Provide exhaust ventilation for arts and crafts preparation areas where off-gassing from significant quantities of materials or products may occur.
- Provide exhaust ventilation for copy/work rooms -
  - Most copier manufacturers can provide an optional vent kit
  - A small exhaust hood over a work surface, similar to a fume hood in a science lab, reduces exposure when adhesives, sprays, paints and solvents are being used in the workroom.

Mechanical Air Movement

- Package Terminal Air Conditioners (PTAC) are ductless conditioning and ventilating units.
- Direct ventilation connection to the outside.
- Ductless

HVAC Custom Enclosure Co.

Mechanical Air Movement

- These are ducted units, drawing ventilation air in from the roof of the building.
- Could be either a supply or exhaust system.
- Fresh air damper may be motorized or fixed.
- Control of outdoor air quantity that enters the building can have a significant impact on IAQ. Demand control is commonly used for humidity control and may reduce the supply of outdoor air below the recommended minimum for the purposes of saving energy not for improving IAQ.

Howard Services

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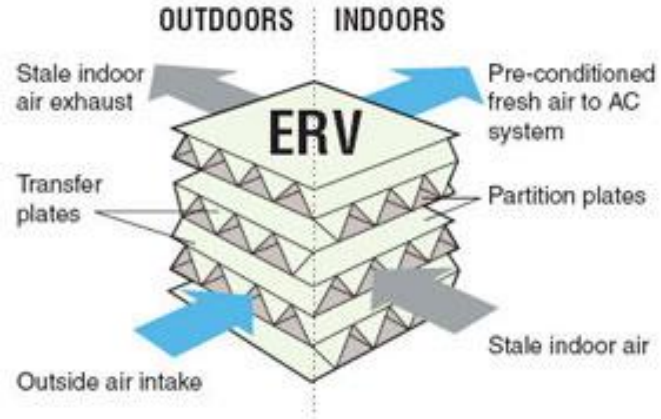
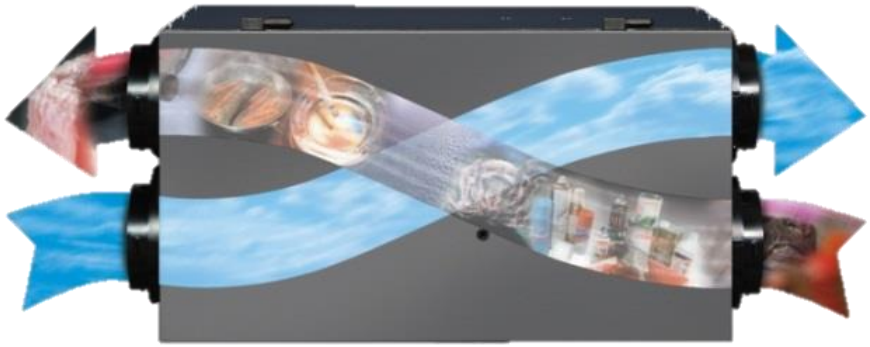
Mechanical Air Movement

- Heat exchangers precondition the incoming air stream with energy from the outgoing air stream.
- These can be stand-alone systems or connected to the HVAC ductwork.
- The bottom of air intakes should be at least 8 inches above horizontal surfaces (generally the ground or the roof) to prevent blockage from leaves or snow. In northern locations, more separation may be needed due to greater snow depths or drifting snow.



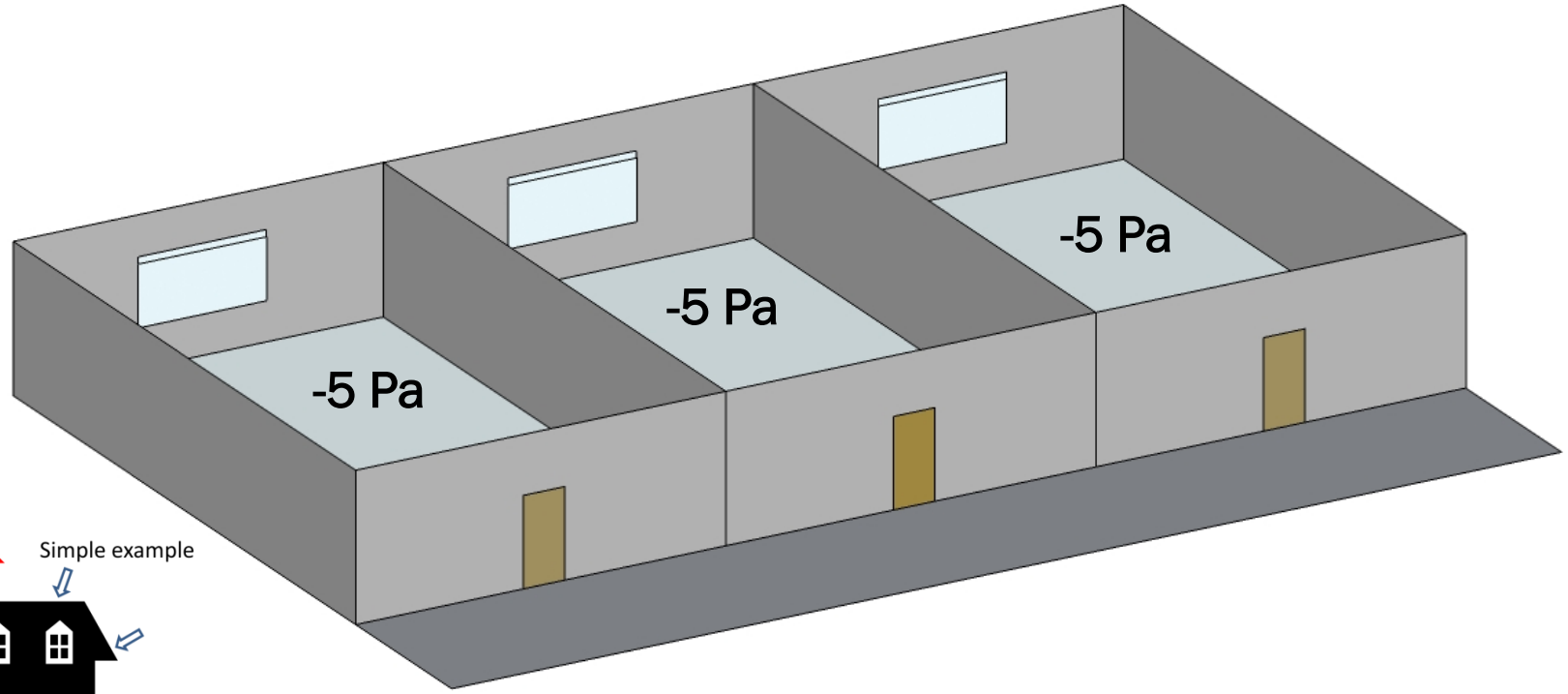


Courtesy of Heyoka Solutions

Heat Exchanger Ventilation

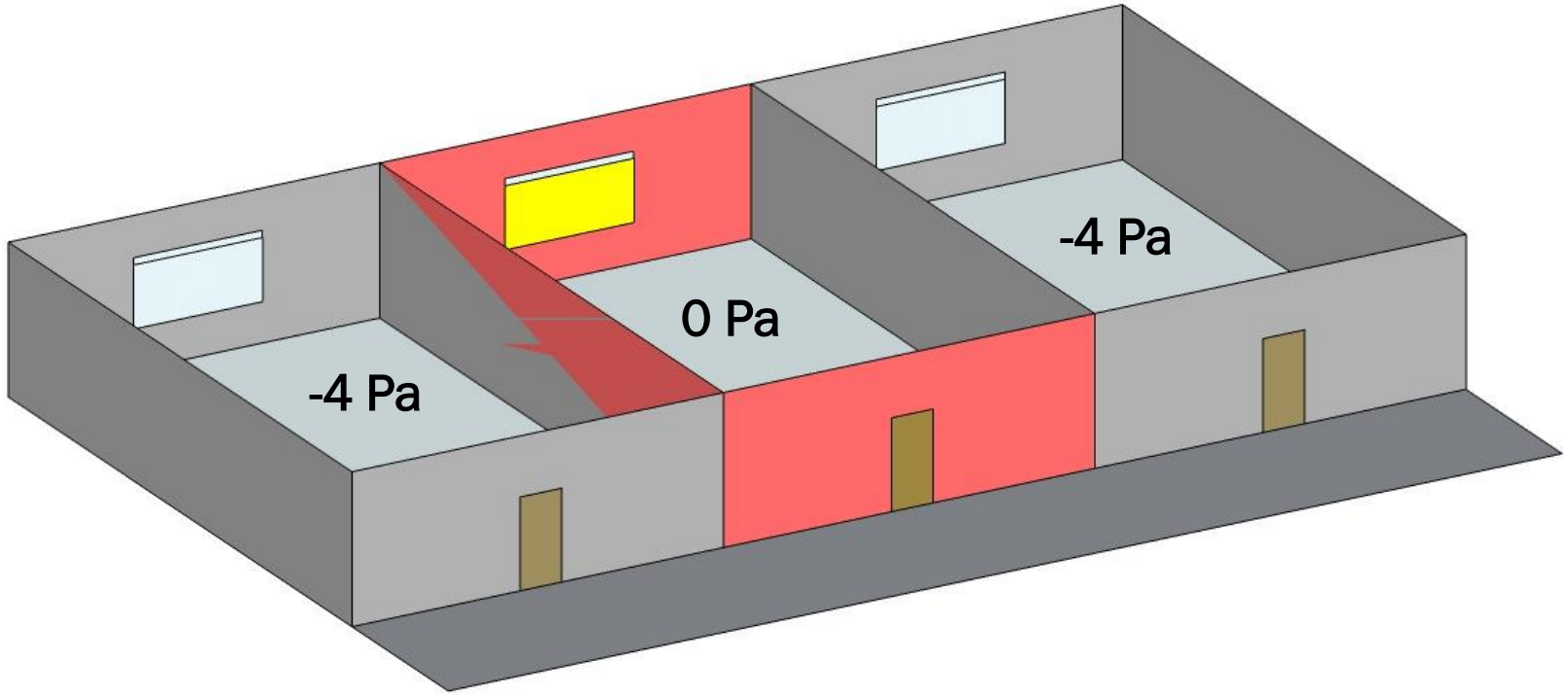
- Intakes should not be placed within 25 feet of any potential sources of air contaminants, including sewer vents, exhaust air from the school, loading docks, bus loading areas, garbage receptacles, boiler or generator exhausts and mist from cooling towers.
- Grilles protecting air intakes should be bird- and rodent-proofed to prevent perching, roosting and nesting.
- An insufficient amount of ventilation air is often the result of clogged intake screens that are inaccessible for inspection and cleaning. Screens hidden by an intake grille should be designed with a grille that is easily opened, such as a hinged grille with two quick-release latches, or in the worst case, a grille with four one-quarter turn fasteners. All screens should be easily removable for cleaning.
- Consider adding a section of sloped intake plenum that causes moisture to flow to the outside or to a drain if intake grilles are not designed to completely eliminate the intake of rain or snow.

Exhaust-only rooms



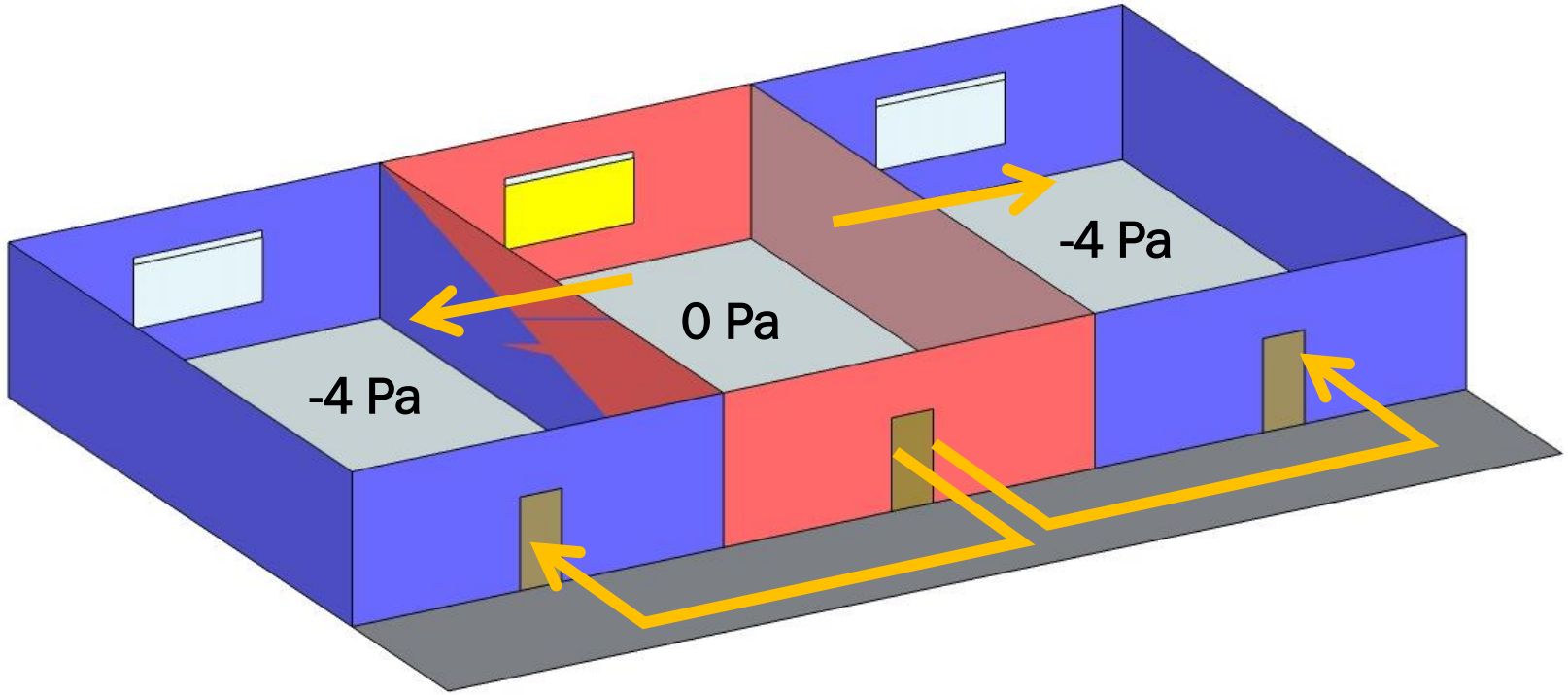
- Rooms all equally depressurized due to central exhaust ventilation.

Open window



- Someone spills some paint in the middle room.
- They open the window, the room pressure drops to 0 Pa WRT outside

Other rooms receive pollution



- Middle room drops to 0 Pa WRT outside
- Net pollutant transfer to other rooms

Ductwork

- Ducting guides the airflow. Leaks in the ductwork reduce the amount of delivered flow and put spaces under unanticipated positive or negative pressures.
- Preventing moisture from entering duct work is critical to preventing mold problems in all types of ducts. Moisture in ducts is usually due to penetration of precipitation through inlet louvers, excess moisture in outdoor air, or condensation droplets from cooling coils that are not properly drained or ducts that are not properly sealed.

Ductwork

- In addition to significant energy losses, air leakage from HVAC ducts and air handling units cause significant IAQ problems due to unexpected airflow between indoors and outdoors and between areas within the school. Air leakage from supply or return duct work contributes to the condensation of humid air in building cavities and/or on the neighboring surfaces.

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Filtration

Air filters should have a dust-spot rating between 35% and 80% or a Minimum Efficiency Rating Value (MERV) of between 8 and 13.

Airflow must not bypass the filters due to duct leaks and poor installation.

Labeling of HVAC components is an inexpensive and effective method for helping facilities personnel properly operate and maintain the HVAC systems. The labels should be easy to read when standing next to the equipment and durable to match the life of the equipment to which they are attached.

Courtesy of Heyoka Solutions

Filtration

Gas phase filtration

https://hydrosilintl.com/air-filtration/

Pictures from Bill Palmer of Aeromed

Upper room UVGI

Assessing the Systems

- Make an inventory of all the ventilation system components – exhaust fans, heat/energy recovery ventilators, exhaust hoods, terminal units, filtration systems, etc.
- Verify that dampers are not blocked, the filters are clean, and the fans are running.

Assessing the Systems

- IAQ problems are often traced to improper pressurization, which causes unexpected airflow between indoors and outdoors and between areas within the school. To reduce introduction of unconditioned moist air and pollutants from outdoors, the building should be designed to operate between zero and 0.03 in. w.g. (0 to 7 Pa) positive, relative to outdoors.
- Exhaust fans put the building under negative pressure. Supply fans put the building under positive pressure.

Assessing the Systems

- Some of the most powerful fans in a school are in the kitchens. Cooking produces large amounts of particulates that need to be drawn away. Cooking effluents contain potent VOCs.
- Kitchen exhaust fans can put the entire building under negative pressure, even making it difficult to open the building's doors!

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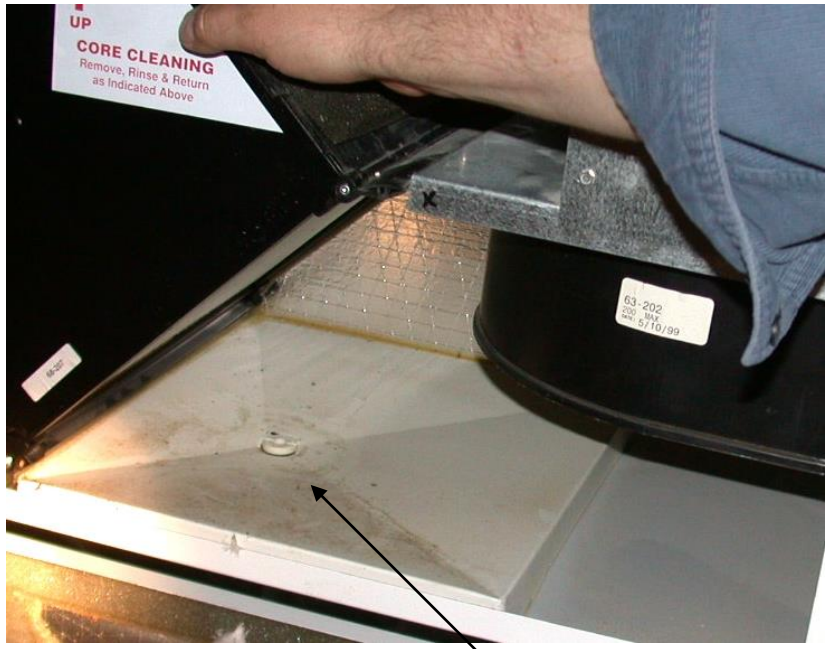
Assessing the Systems

Fresh air intakes are connected to the outside. They need to be carefully assessed for performance.

Jeff May – May Indoor Air Investigations, LLC



Residue on drain pans

Jeff May – May Indoor Air Investigations, LLC

Debug the system

Assessing the Systems

Air Handling Unit	
	Is the system turned on?
	Is the airflow from vents sufficient?
	Are the fans turned on?
	Are the filters clean and properly installed?
	Are dampers operating correctly?
	Is there moisture, debris or mold in or near the unit?
	Are drain pans clean and sloped toward the drain?
	Do coils need to be cleaned?
	Is combustion equipment properly vented without flue leaks or backdrafting?

Airflow Measurement

- Smoke stick

Courtesy of Heyoka Solutions

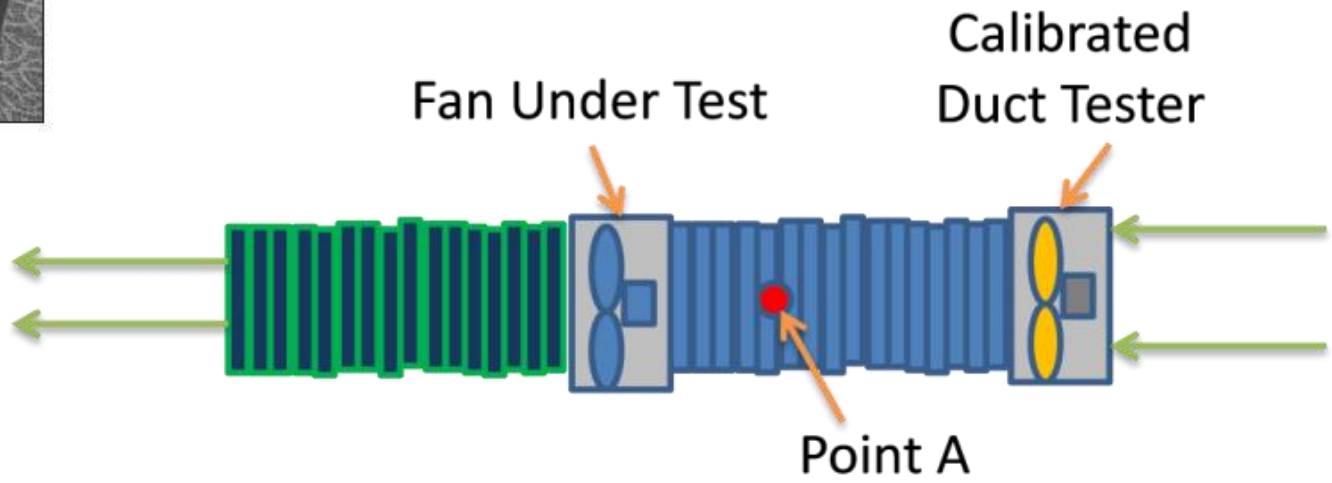
- Anemometer

Smoke sticks provide an indication of flow and flow direction. Mini- anemometers are an inexpensive way to measure the velocity of airflow.

Corsi-Rosenthal air purifier is a simple, do-it-yourself box fan on top of a box constructed of four MERV 13 filters.
Plans are available on-line

Airflow Measurement

DG700 Accuracy: 1% of pressure reading or .15 Pa, whichever is greater



When the pressure at Point A = 0 pa, the flow through the Duct Tester fan = the flow through the fan under test.

Airflow Measurement

- Fan being tested depressurizes the box
- Calibrated tester fan pressurizes the box
- When the pressure in the box relative to the room equals zero, the flow through the calibrated tester fan equals the flow through the fan being tested.

Courtesy of Heyoka Solutions

PTAC "fresh air kit"

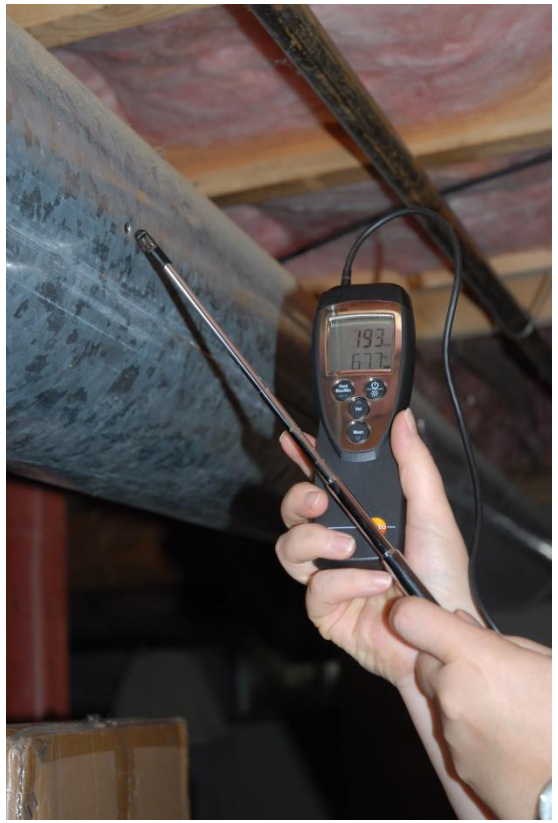
Airflow Measurement

- Balometer with capture hood

A Balometer will measure flows between 10 and 500 cfm.

Courtesy of Alnor

Airflow Measurement



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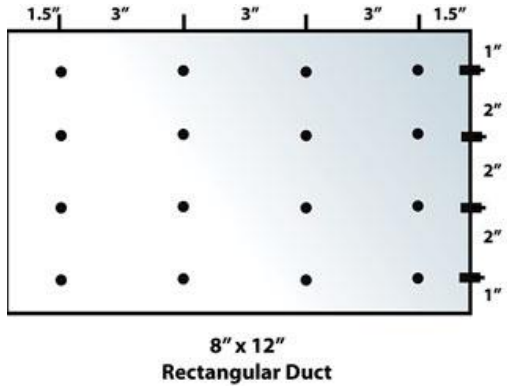
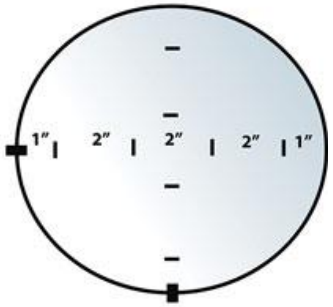




Duct traverse

Flows vary across the plane of the ducting which makes numerous measurements critical for accuracy.

Troubleshooting & Maintenance

- Install simple pressure differential gauges across all filter banks.
- No more guessing if the filter needs replacing.
- Gauge range of zero to 1.0 iwg save money and the environment
- Gauge easily visible by maintenance personnel.

Troubleshooting & Maintenance

- The number or name of the AHU (e.g., AHU ##, or AHU for West Wing)
- The outdoor air (OA), supply air (SA), return air (RA) and exhaust or relief air (EA) connections to the AHU, each with arrows noting proper airflow direction
- The access door(s) for the air filters and the minimum filter dust-spot (or MERV) efficiency (Air Filters, minimum xx% dust spot efficiency)
- The filter pressure gauge and the recommended filter change pressure (Filter Pressure, max 0.x in. w.g.)
- The access door(s) for the condensate drain pan (Drain Pan)
- Other pertinent access doors such as to energy recovery ventilation wheels or plates (Energy Recovery Ventilation Unit)

Troubleshooting & Maintenance

- The minimum amount of outdoor air for each AHU (### CFM minimum during occupied times)
- The outdoor air damper (OA Damper), with special marks noting when the damper is in the fully closed (Closed), fully opened (open) and minimum designed position (Min)
- If a motorized relief damper is installed (EA Damper), note the same positions as above.
- The access door to any outdoor air controls (OA Control(s)) such as damper position adjustments, outdoor airflow measuring stations, resets, fuses and switches)

Troubleshooting & Maintenance

- Breakers for exhaust fans (Exhaust Fan ##), AHU, unit ventilators
- Access doors for inspection and maintenance of air ducts
- Any dampers and controls for air side economizers (as appropriate)
- The number or name of all exhaust fans, including the air quantity exhausted (EF##, ###CFM)

References

- Interactive School Ventilation Tool: https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/interactive-ventilation-tool.html

Energy CLASS Prize – Indoor Environmental Quality (IEQ)

Module 6 – Evaluating IEQ Risks and Hazards in Schools

December 5, 2023

Kevin Kennedy

Kevin Kennedy has over 30 years' experience as an environmental health scientist, the last 21 years' work at Children's Mercy Kansas City (CMKC). Mr. Kennedy led the establishment of the Environmental Health Program (EHP) and through his and the EH team's effort, they have assessed thousands of homes and schools, providing patient families, childcares, and school officials with guidance in addressing environmental risks that may result in health problems for children.

Mr. Kennedy is a co-author on more than 30 research publications and has taught thousands of professionals, educators, and advocates about environmental health assessments and investigations, environmental measurement, and sampling, building science, and the healthy housing and schools' principles. Through his work he presented workshops and presentations on healthy housing, healthy schools, environmental health, and children's environmental health, among other topics, to thousands of people at conferences, national and regional summits, and local health provider meetings.

Learning Objectives

Utilize a consistent process for assessing building issues

- Develop a knowledge-based systematic approach to IEQ
- Identify existing assets
- Develop standard operating procedures

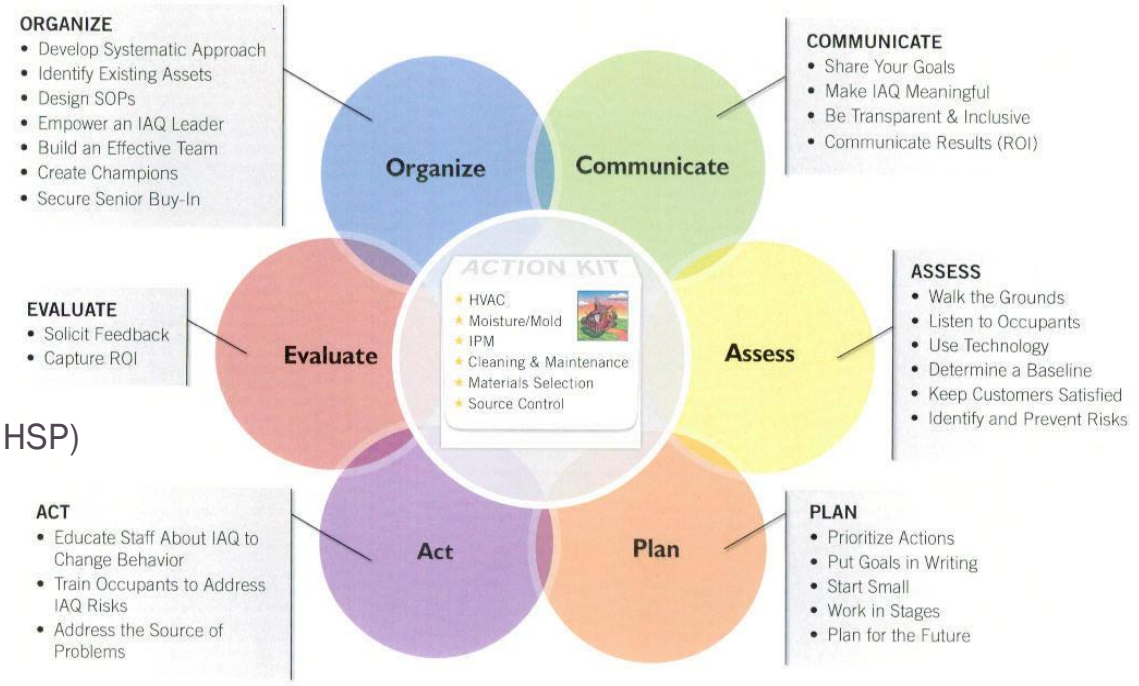
Implement established keys needed for a sustainable program

- Empower an IEQ leader
- Build an effective team
- Create champions
- Secure senior buy-in

Reminder:

When assessing school indoor environments, use some version of the EPA Tools for Schools - "Super 6" Technical Components for your assessment

- HVAC Systems and Ventilation
- Cleaning and Allergen Control
- Moisture Control / Mold Prevention
- Source Control/Room Contents
- Safety, Security, Injury Prevention (added by Children's Mercy HSP)
- Integrated Pest Management (IPM)
- Learning Environment (added by Children's Mercy HSP)



Adapted by the Children's Mercy Kansas City Healthy Schools Program from the U.S. EPA. 2007. Envisioning Excellence and the Framework for Effective School IAQ Management: Six Key Drivers. The 8th Annual IAQ TfS Symposium, Washington, DC

The most important part of any building assessment is a visual assessment.

- The research evidence shows trained assessors with the appropriate knowledge are more accurate and identifying building-related issues than occupant-based observations.
- Assessments should be comprehensive and involve all areas and systems if possible.

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- Sometimes measurements are useful in better interpreting observed issues and identifying solutions
- Measurements should always inform the visual assessment and not the other away around.

National Building Upgrade Prize

If you observe anything that doesn't look right, ask the building managers questions to help you interpret what your observing

- How long have the ceiling stains observed been on the ceiling tiles?
- What happens when it rains?

Image ©2023, used with permission from Luke Gard, Children's Mercy Kansas City Healthy Schools Program

- Have you had any plumbing problems in other parts of the school building?
- Have you reported any of these observed issues to custodial staff or maintenance?

Evaluating hazards and risks identified during school assessment has 2 components with 3 steps each:

A

1. What was observed?
2. What is your interpretation?
3. What questions do you want to ask staff?

B

1. Identify the hazard
2. Justify why a hazard
3. Prioritize the risks of each based on hazard and exposure risk

Image from Health Housing Solutions

There are different ways to interpret the risks and hazards observed–

- Some interpretations are just logic
  - If I observe severe corrosion on metal components, logic indicates these parts need to be replaced

- Other interpretations are based on knowledge of research evidence
  - Filthy carpeting many upholstered items in an indoor environment can pose an exposure risk based on what the research evidence has shown

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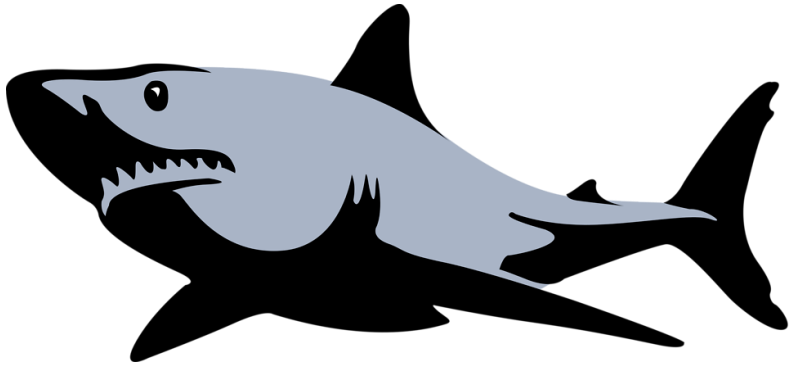
It's important to be able to support your concerns about environmental exposure risks by being aware of research evidence

Avoid claims of exposure concerns based only on myths and legends

Classic Examples
Routinely disinfecting surfaces is required for good health
Air fresheners provide real benefit and are worth any risk
You have to use bleach to clean effectively
Green schools are about more than energy efficiency
Radon myths are not exaggerated.

Always consider exposure as a factor in prioritization

Which animal is most likely to kill you?



Courtesy of Heyoka Solutions

Remember, Risk = Hazard X Exposure

Remember, identified exposure risks and hazards should be justified as to why they're a hazard and can be prioritized based on their relative risk

Acute hazards are critical issues that require immediate attention due to the potential for posing an imminent danger to life and health of occupants.

Chronic hazards are persistent problems that may not pose an immediate danger to the building occupants but exposure these problems in buildings may promote allergies, asthma, lead poisoning, pesticide exposure, or other chronic health conditions

Recommendations are issues identified that are not an acute of chronic hazard and do not pose an exposure risk, but likely should be addressed when funds allow. These should be reported to building maintenance and custodial staff.

When you review the issues observed during a school assessment, remember the evaluation process:

What are we observing?

What do we interpret?

Is this a hazard? (Identify)

Why is this a hazard? (Justification)

How would we prioritize this hazard?
Acute? Chronic? Recommended?

Image ©2023, used with permission from Luke Gard, Children's Mercy Kansas City Healthy Schools Program

Review issues observed from a school assessment using the evaluation process:

What are we observing?

What do we interpret?

Is this a hazard? (Identify)

Why is this a hazard? (Justification)

How would we prioritize this hazard?

Acute? Chronic? Recommended?

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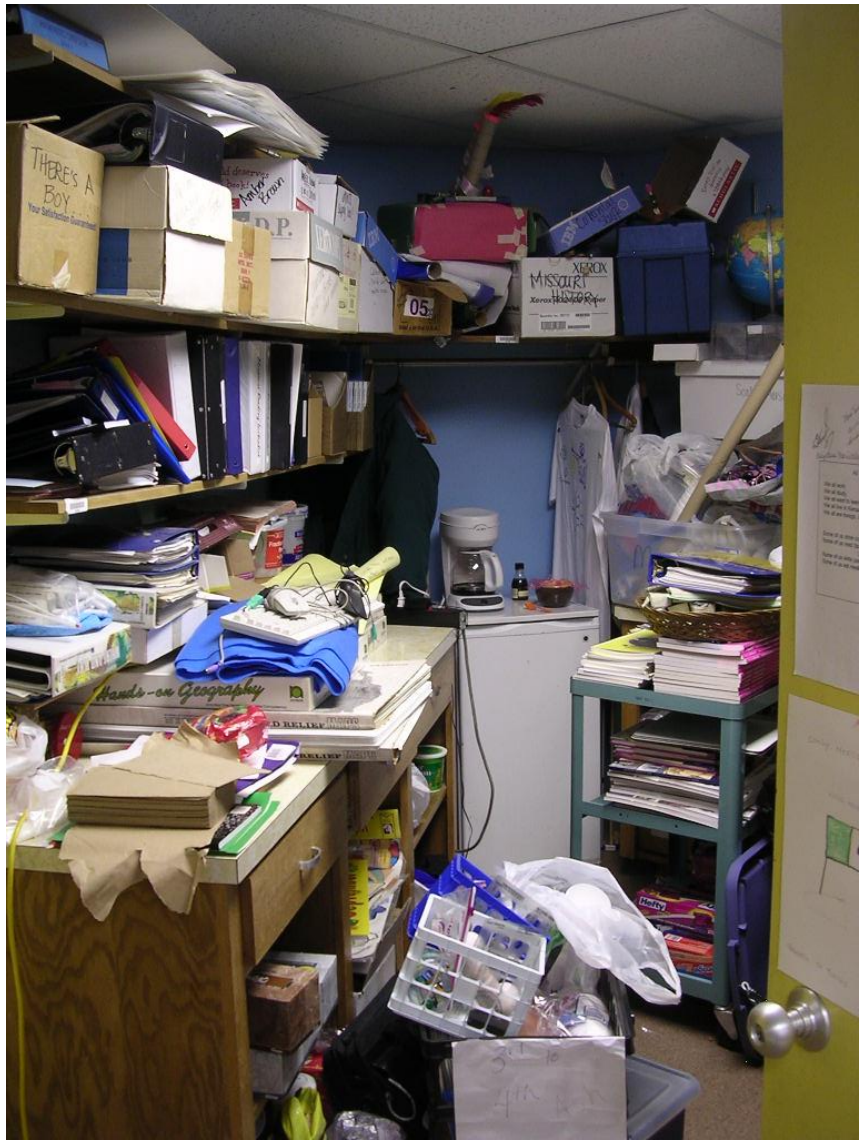

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Review issues observed from a school assessment using the evaluation process:

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Is this a hazard? (Identify)

Why is this a hazard? (Justification)

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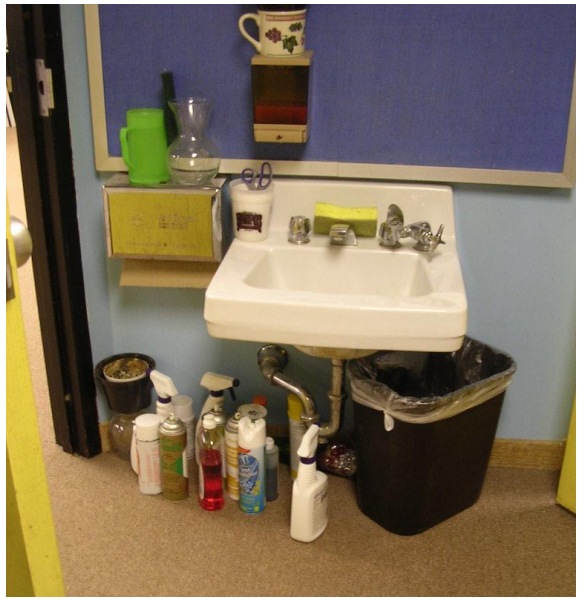
Acute? Chronic? Recommended?



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How significant is the problem? Is it actually a problem at all?

What does that ceiling stain mean?

- May indicate an older or current, active issue
- Depending on cause and location, the issue can be prioritized accordingly
- Regardless of appearance, many ceiling stains are just that…stains

Is one pest a problem?

- Depends on where pest is found and what type of pest
- Has Integrated Pest Management been employed?
- Can you think of other circumstances?

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Case Studies:
Let's look at real-world examples of School IEQ issues

- Case information
- Observations and interpretations to identify and prioritize risks
- Begin working toward resolution of the issue

Building complaints

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Case – You are getting several reports from one of a middle school in the district of higher-than-expected visits to the nurse in the clinic with several students having asthma flare-ups during the day. Some teachers report what they think are exhaust fumes in the hallways especially around lunch time and just before school ends for the day.

Discussion – You complete a walk-through of the building and immediately observe issues with the placement of air intakes for different areas of the building. Some air intakes are at the back of the building and right next to the loading dock. The dumpster even sits directly underneath. Air intakes for some classrooms are blocked outside from special planting, maybe used by a science teachers for their class. They are also surrounding an AC condenser.

Actions towards solutions:

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The results of your assessment should be assembled in a simple action plan and shared with the building leadership team. It is always helpful to take photos and include them in the action plan summary. Meet with the team in person if possible and show them your observations, even visiting to location of concern.

Upper photo - it will be useful to talk with custodial staff and find out the frequency and time of day for when trucks use the loading dock, and how often the dumpster sitting underneath the air intake is emptied during the week. It may be useful to collect some measurements to determine how much how much exhaust fumes and particulate may be entering the air intakes as a result of diesel truck parking. A review with the building team should result in an action plan that includes immediately establishing a policy that all trucks that pull up to the loading docks must turn their engines off while parked at the dock. Long-term it will be necessary to develop possible plans for modification or relocation air intakes.

Lower photo – it appears there are large plants directly under some of the air intakes from this side of the building. It will be important to talk with staff and see if there's a reason for having this vegetation in its location outside these classrooms. Sometimes science classes use these areas for studying plant biology and other activities. The Building team should work with them to relocate the plants away from air intakes and AC condensers.

Ms. Johnson's classroom

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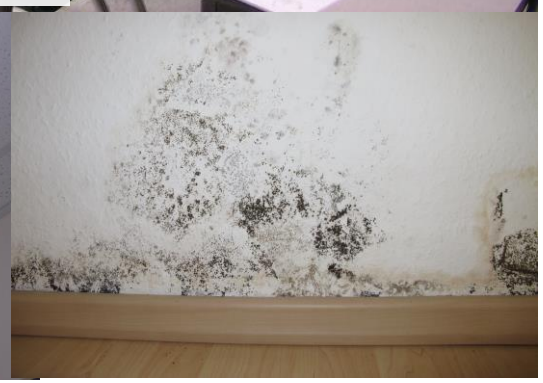
Air handler shows corrosion



Back exterior wall of room

Case – Ms. Johnson has complained to the principal that there are odors in her class that she thinks are associated with an increase in allergy and asthma symptoms for some of the children in her class

Discussion – Perform room assessment
Two walls are exterior walls. The general condition of the room appears good. There is not a lot of clutter and there are not a lot of dust reservoirs. Room looks like it has been cleaned recently. There are stained ceiling tiles and evidence of suspect mold on the bottom of a wall in the back of the room. You measure high humidity and your moisture meter shows some area on walls are wet.

Ms. Johnson's classroom

Actions towards solutions:

The results of your assessment should be assembled in a simple action plan and shared with the building leadership team. It is always helpful to take photos and include them in the action plan summary. Meet with the team in person if possible and show them your observations, even visiting to location of concern.

Image ©2023, used with permission from Luke Gard, Children's Mercy Kansas City Healthy Schools Program

Air handler shows corrosion

Back exterior wall of room

It will be important to identify possible sources of moisture leakage into the plenum based on the location of the water stains on ceiling tiles. The maintenance staff should be directed to do a careful inspection of the roof over this part of the building, as well as, all areas around the exterior walls on the outside, to ensure there is proper drainage and landscaping. Ceiling tiles should be replaced, and a date recorded on the back side of the tile, indicating the time of replacement, in the approximate area of the current stain in case leaks continue. Based on the results of the moisture meter reading and mapping of the wet or damp areas, a plan to resolve the chronic moisture problem needs to be developed. The areas of suspect mold contamination on the wall appear to be less than 10 square feet and can be cleaned up by custodial staff very specific training and instruction. They should follow EPA guidance for proper cleaning. It may be useful to record a date somewhere in this area of the wall indicating the date of cleaning should new mold colonize the existing wall area. This would be an indication that the moisture issue has not been resolved and a more extensive evaluation may be necessary. A dehumidifier may need to be installed by maintenance, and monitored by custodial staff, as an interim control for managing excess humidity in this area, but this should be overseen by the building team.

Ms. Smith's classroom

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Case – Ms. Smith tries to provide a comfortable space for her 2nd graders. But she finds by the end of most days she has a headache. She thinks it must be mold somewhere in the classroom.

Discussion - Perform room assessment
You don't observe any direct evidence of moisture issues (required for mold issues). The room is a little cluttered and appears like it may be hard for staff to clean routinely. The room has really strong aromas coming from various areas. As you look more carefully, there are plug-in air fresheners and heated wax fragrance making devices throughout the room.

Ms. Smith's classroom

Actions towards solutions:

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Just like the other examples, the results of your assessment should be assembled in a simple action plan, including photos, and shared with the building leadership team.

Solution can be complicated: The issue in this room is related to personal preference of the teacher. They are introducing a significant amount of contaminants to the indoor air of their classroom. They may not be aware of the direct health affects of long-term exposure to high levels of VOCs in the indoor air. They may also not be aware of the impact on their students. The issue in this room needs to be handled differently from the previous examples because it has more to do with personal preferences. It may be more effective for specific members of the building leadership team to meet with the teacher. Sometimes, one individual is enough.

Some schools establish policies prohibiting air fresheners and heated wax fragrance devices in any building in their district.

Mr. Hoffman's classroom

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In front of unit ventilator

Case – Mr. Hoffman is a very popular teacher. The 5th grade kids love his class because he has some animals in the classroom for when he teaches science. But the room has some strong odors that some parents have complained about

Discussion - Perform room assessment
The room is organized and clean. But the room does have really strong odors. There are several small cages in the room with various insects, lizards, and turtles. There is also a larger cage in front of the unit ventilator that has a rabbit in it. The bedding is clean during the assessment, but the area in front of the air return is blocked and the supply vents are obstructed by tubs and books, providing little to no air circulation to the room. A portion of the supply air blows directly across the rabbit cage dispersing any odors and fine particulate across the entire learning space.

Mr. Hoffman's classroom

Actions towards solutions:

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In front of unit ventilator

Just like the previous example, the results of your assessment should be assembled in a simple action plan, including photos, and shared with the building leadership team.

Solution here may also be complicated: The issue in this room is also related to personal preference of the teacher. It's great that Mr. Hoffman likes to have animals available for the students to observe directly and learn their natural history so you have to weigh the benefit of having animals in the room with the potential environmental risks of living with animal bedding and waste products a daily basis the other important issue is that Mr. Hoffman has blocked the unit ventilator so it does not get adequate return air from the room and it blows directly across the rabbit cage dispersing any odors and find particular across the entire learning space. Mr. Hoffman may not be aware of any possible health affects from long-term exposure to the pet odors and particulate from the animal cage. They may also not be aware of the impact on their students. This may be another issue that needs to be handled by specific members of the building leadership team, or one individual may be enough.

Some schools establish policies prohibiting resident animals in any building in their district, but they do allow animal "visitors" that can be in the classroom for short periods.

Mr. Erickson's classroom

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Case – Mr. Erickson teaches Kindergarten and keeps a well-organized, clean classroom. Because this is Kindergarten, they have daily snacks in the room. Custodial staff like him because he routinely cleans his room himself and has the kids help. There are reports of pretty strong chemical odors in his classroom during the day.

Discussion - Perform room assessment
Your observations confirm the room is very clean. But the room does have a really strong aroma of cleaning agents. Mr. Erickson says he sprays down surface at every recess and lunch period. Opening the cabinets under the classroom sink you observe a lot of products he has brought from home to use in the classroom. The chemicals are stored with food and drink supplies used for the daily in-classroom snacks. The kids are often asked to help retrieve supplies and snacks.

Mr. Erickson's classroom

Actions towards solutions:

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Just like the previous example, the results of your assessment should be assembled in a simple action plan, including photos, and shared with the building leadership team.

Solution here may also be complicated: The issue in this room is related to personal preference of the teacher. It's great that Mr. Erickson is so proactive in cleaning and that he gets his students so actively involved in maintaining the classroom and helping with snacks. However, they are introducing a significant amount of chemicals to the surfaces and indoor air of the classroom. They may not be aware of the direct health affects on the students or themselves from long-term exposure to high levels of chemicals in the room. This is another issue that needs to be handled by specific members of the building leadership team, and even the principal on an individual basis. Teachers should not be allowed to bring chemicals from outside sources where ingredients and safety data sheets are not readily available as a child accidentally ingest any of these products there becomes a significant safety issue.

Some schools establish policies prohibiting any products from being brought in from outside. An important and useful practice is to provide any staff that request it, their own containers of district-purchased and approved cleaners in bottles that have been properly labeled with safety information, provided by the district.

All school districts have similar primary goals:

- Manage facilities to optimize student success
- Meet or exceed state standards for academic performance
- Provide the healthiest learning environments for students, staff, and visitors

National Building Upgrade Prize

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Healthy schools require integrated, effective & sustainable management

Communication is critical:

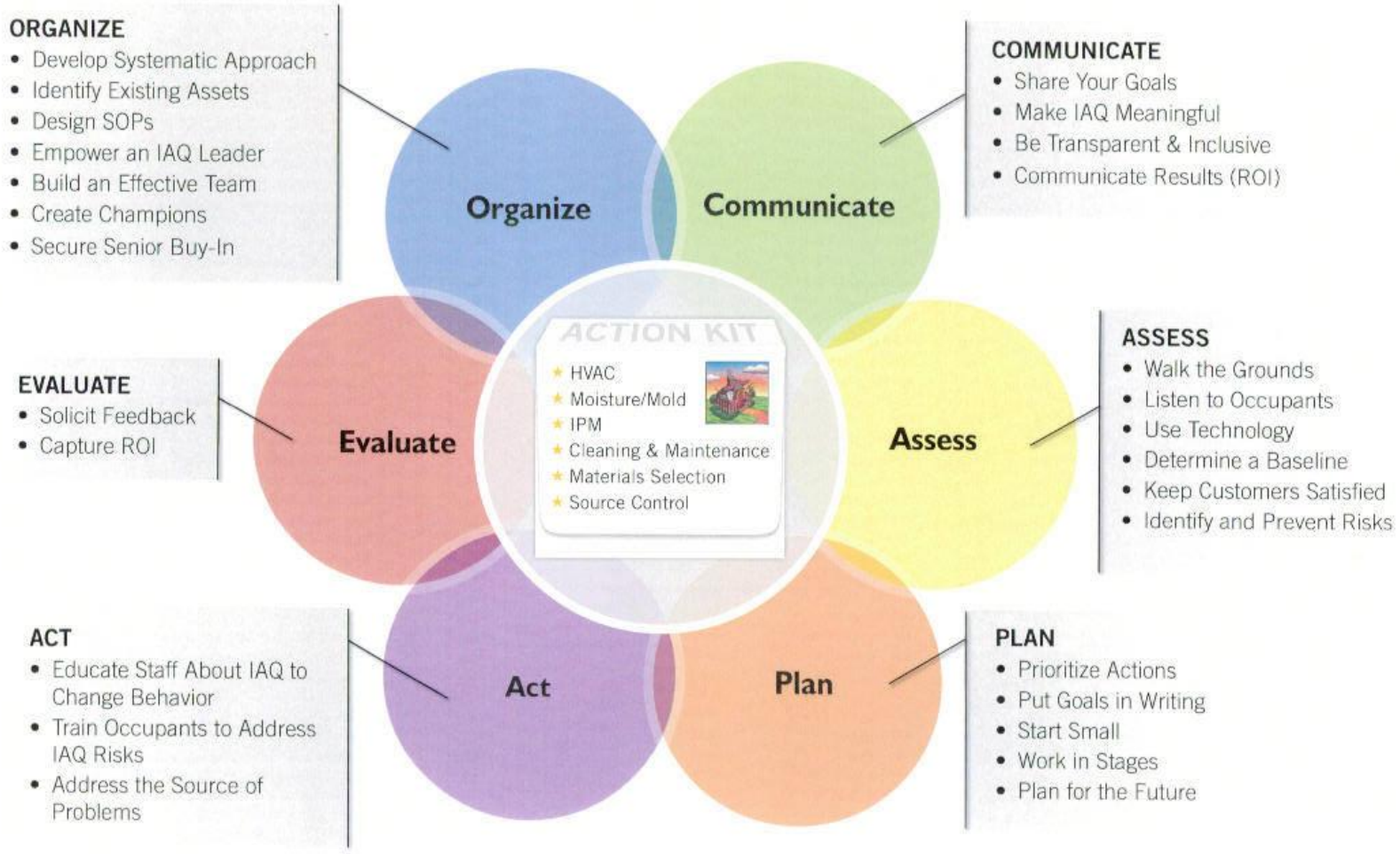
- Create district-level and building-level teams to discuss and address issues
- Share information
- Teams will need access to environmental expertise:
  - IEQ Professionals OR
  - Staff *trained* in school indoor environmental health.

Healthy Schools Programs should be comprehensive

An Integrated approach that considers:

- People occupying the school
- Any potential health hazards
- How the facility is cleaned, maintained, and operated
- How to reduce absenteeism and increase student performance
- The facility structure itself

EPA's framework for effective school IEQ management is an excellent starting place for organizing your program



U.S. EPA. 2007. Envisioning Excellence and the Framework for Effective School IAQ Management: Six Key Drivers. The 8th Annual IAQ TfS Symposium, Washington, DC

Why do districts fail to implement IEQ management plans?

Many districts feel overwhelmed by the process of creating Healthy Schools Plan:

- Interest wanes after an issue has been resolved
- Time and budget constraints
- “Champion” of the program leaves
- Fear of IEQ “Pandora’s Box” and negative publicity
- IEQ issues not important as, or are separate from, student academic and test performance

Sustainable School IEQ programs get everyone involved

- District Healthy School Teams include board members, teachers, nurses, parents, and you….
- Building Healthy School Teams include: the principal, nurse, lead custodian, a teacher and a district administrator.
- Teams should be integrated into existing district activities…

  (Part of Health and Wellness, or Building Administration meetings)

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Key Messages

- Utilize a consistent process for assessing building issues.
- Evaluating hazards and risks identified during school assessment using the 2 component-3 step process to identify and prioritize issues observed
- Determine the relative risk of hazards and prioritize acute over chronic hazards to ensure they are addressed in a timely manner

Key Messages (continued)

- Communicate with all staff about why an issue is a concern and seek their help in reducing exposure to any indoor environmental exposures in schools
- All school districts have the same goal of managing facilities to optimize student academic performance by providing the healthiest learning environments for students, staff, and visitors
- Creating healthy schools require an integrated approach involving all stakeholders in creating effective & sustainable School IEQ management programs

Questions & Discussion