Questions and Answers from the Virtual School Walkthrough Webinar

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Mold and Moisture

Q: In order to test for mold in school buildings, do you need to use a test kit?

A: Testing for mold in a school building should generally be considered a last resort, because conventional wisdom is that testing won't reveal information that cannot be more easily and reliably obtained by a thorough visual inspection. If you don't see or smell mold, you likely don't have any reason for concern. If you do see it, you already know you have it and need to carefully eliminate it, with usually no need to know what kind it is or how much of it is airborne.

Q: What is mold food?

A: Cellulose is prime mold food, especially when saturated. Mold can grow on glass, but it is actually feeding on the dust, skin and/or organic matter on the surface of the glass. When we speak of keeping mold food out of the way of excess moisture in a school, we are typically talking about cardboard boxes, books and paper, wall board, and ceiling tiles.

Q: What is the best way to conduct a mold and mildew inspection when it is not visibly apparent?

A: If you can smell mold, but you can't see it, look at the predictably leaky areas first. We, personally, would remove the electrical outlet cover plates and sniff wall cavities for a stronger source of the smell; however, sensitive individuals should not use their nose as a tool. We used to stare at walls and wonder aloud with a teacher if there was mold in the cavity. Now, we

advise that someone with the appropriate authority make a small inspection hole to confirm or deny the fear, and cover that hole with a blank outlet cover plate. If you can smell it, but can't see it, another trick is to use chemical smoke to show where air is leaking into the room and to follow that smoke upstream toward the source of the air entering the room. Following the air upstream has often led us to a stinky crawlspace above or below a classroom. If you find mold, seal it up until you can get it remediated. Moisture meters can be used to quickly survey the walls for moisture readings approaching or above 18 percent – the content at which mold will get a foothold.

Source Control

Q: What are the names of the four green chemicals you mentioned during the webinar?

A: Good practice suggests we should not use heavy-duty, industrial-strength chemicals in our schools, and the good news is that we don't have to. Today, schools can easily clean their buildings with approximately four human and environmentally friendly products. There seems to be a lot of "green-washing" in the marketing industry these days, so just because a product is advertised as "green" doesn't mean that is it. We like to rely on the 3rd party approval rating by Green Seal. Many of the major custodial and cleaning suppliers have a line of "green" cleaning products.

Basic categories to look for from your custodial supplier:

Institutional Cleaning Products (GS-34, GS-37, GS-40):

- GS-34 Cleaning and Degreasing Agents
- GS-37 Cleaning Products for Industrial and Institutional Use
- GS-40 Floor-Care Products for Industrial and Institutional Use

For example, one major supplier in the Pacific Northwest offers these five Green Seal listed products:

- General Purpose Cleaner
- Glass Cleaner
- Neutral GP Cleaner
- HD Cleaner
- Washroom Cleaner

The bottom line is to inventory the products and equipment used in your schools, and then evaluate them in terms of occupant exposures, custodial exposure, environmental impacts, effectiveness, and lastly, cost. It is false savings to save a few dollars on cleaning products if these cause unintended consequences for people and the environment.

Many resources are available to help you choose the right product for your school's cleaning requirements.

Q: New studies show that in some cases indoor air contains fewer pollutants than outside fresh air. In this case, is it still recommended to bring in a certain percentage of outside air?

A: If freshness becomes an issue in the short term then there are some options: windows can be opened for a brief blow out of the classroom during freezing weather and better filters can be temporarily installed for dust storms. In climates where it stays bitter cold for weeks and months, permanent mechanical solutions are necessary to protect against frozen pipes and comfort issues.

Q: Can plants help improve indoor air quality?

A: Do not be misled by the myth that plants can clean the air in a school. It would take way too many plants to make a difference. Also, please note that plants can be overwatered, get messy and become mold issues, especially if placed in wicker baskets and not managed carefully. Too many plants – some classrooms can look like a jungle – can present moisture and mold issues simply from the volume of wet soil. Plants also harbor creatures (e.g., mites, aphids) and produce pollens and other allergens. However, a few well-managed plants should not present a problem.

Q: How can rodents infiltrate an opening as small as a quarter of an inch in diameter?

A: Apparently, mice can flatten themselves and slip into these tiny crevices. We have found that mesh installed to keep the opening small in width and height should confound the critters. I (Dave) just put ¼ by ½ inch hardware cloth under the floor joists in my crawlspace in Central Oregon in hopes of keeping the mice out.

Integrated pest management (IPM) is a concept that involves careful identification of the targeted pests and selection of the least toxic (hopefully non-toxic) alternatives to deal with that pest specifically, without taking out a bunch of good critters that happen to be in the line of fire. The first principle of IPM is reducing the attraction and entry areas to school buildings – keep the building clean and tight and reduce pest habitats near the building.

Walkthrough Best Practices

Q: What is the best way to look for Polychlorinated Biphenyls (PCBs) in caulking, sealants, wire insulation, etc? How can PCB checks be included in a walkthrough?

A: This is an interesting and important question. Clearly schools need to control Polychlorinated Biphenyls (PCB) exposures, and a necessary step is to identify PCB materials and sources. Sampling of PCBs is not part of a routine walkthrough, but it is similar to sampling for asbestos, lead, radon, mercury and other environment hazards in schools.

An in-depth investigation in a high school found PCBs in numerous materials, including but not limited to, laminate adhesive, mastics, paint, gasket, carpet, foam padding and bulk dust (TRC, 2008; Sullivan, 2008; TRC, 2009).

According to the EPA's National Exposure Research Laboratory Office of Research and Development, there has currently been no systematic effort to characterize PCB sources and environmental levels at schools across the U.S. In response, EPA has developed a research plan to measure PCBs in schools. At each school, PCBs will be measured in indoor and outdoor air, soil adjacent to the building, and on surfaces or in dust at multiple locations within the school building. Caulk and other materials that may be primary or secondary PCB sources will be collected for PCB analysis. Sample collection will focus on locations where students are most likely to spend time, including classrooms, libraries, multipurpose rooms, gymnasiums, cafeterias, hallways and the outdoors. For more information contact EPA, and check out "A Research Study To Investigate PCBs in School Buildings, Final Research Plan," June 16, 2010, EPA/600/R-10/074 June 2010 (http://www.epa.gov/ord/).

Q: When beginning a program, do you recommend a limited walkthrough focusing on a few specific issues, such as carbon dioxide and ventilation, and in future walkthroughs look at other issues?

A: The goal of any school IAQ walkthrough should be to understand and document as many indoor environmental conditions as possible in order to create a good set of practice operation and maintenance standards. These practices and policies will be the backbone of the school's IAQ management program. All IAQ management programs should be regarded as "works in progress" because buildings and mechanical systems are dynamic and the activities and needs of the occupants also evolve. A school's IAQ management program should be reviewed frequently with input from all school stakeholders.

Q: Who do we contact in the Northeast to assist us in conducting a walkthrough?

A: Check with your EPA Regional IAQ manager and state program contacts. Other organizations in your state or region that would serve as valuable partners and resources for your efforts include school facility manager associations, school superintendant associations, school safety and health organizations and many others. Many parts of the country are adopting the Building Operator Certification (BOC) program to get facilities staff trained in energy and resource efficiency as well as indoor air quality. Check for BOC classes in your area and suggest your key operations and maintenance staff get involved.

Radon

Q: How often should you regularly test for radon, even if no radon was found during your initial test?

A: Generally, initial testing is conducted as a "screening" procedure to provide fairly immediate results to alert schools of problems. If elevated screening results indicate a radon issue, the school should take immediate action to reduce the indoor radon concentrations to as low as possible, and as quickly as possible. Frequent monitoring is recommended for schools with problems as mitigation system effectiveness may decrease over time. Routine monitoring is the only way to assess radon exposures.

For schools with screening test results suggesting low indoor radon levels, routine monitoring in a percentage of ground-contact spaces should be performed to ensure conditions do not change and result in radon entry and exposures. The frequency of these measurements depends on many factors, such as the radon potential in your geologic area, building remodeling/renovations, indoor space usage, mechanical system changes, capping of surrounding soils with parking lots/sidewalks/other building foundations, etc.

Q: Do you recommend an instantaneous radon testing device or a three to five day test kit?

A: Instant "real-time" radon instruments are relatively expensive, so most schools use the short-term screening test kits. A real-time instrument would be useful for a district that has a significant radon problem and requires in-house diagnostics and frequent monitoring. Electret radon measurement devices can be opened and closed and thus be used to measure radon only during occupied hours, providing a better estimate of exposure. Electrets are reusable and the cost for this equipment is in the range of $2,500 or so.

Q: Our biggest barrier to conducting school walkthroughs in my school district is administrator reluctance for fear of expensive mitigation costs. To address this problem, we recreated the Minnesota school walkthrough program to look at low- and no-cost issues only. Is grant funding available to help cover the costs of radon mitigation?

A: School administrators' use of fear of mitigation costs as an excuse to ignore radon exposure by school children and staff would be considered negligence by many. Radon is a serious health risk. School districts with buildings that have elevated indoor radon concentrations should take action to reduce exposures. Schools should be aware that low-cost reductions are often achievable. For example, we have seen schools significantly reduce radon entry by simply modifying the operation of the air handling system to reduce negative pressures that exacerbated radon entry. Immediate investigation and efforts to impact radon entry should be performed. Funding radon reduction should be top priority.

Measurement Instruments

Q: What guidance do you suggest for interpreting particle counter results? Can you recommend a particle counter brand or model that counts a broad range of particle types?

A: The value of particle counters is to provide routine monitoring of particle exposures in schools to alert staff of changes in particle concentrations, comparing room-to-room and zone-to-zone. For instance, a counter may be able to detect if particles from ceramics class or woodshops are migrating to other parts of a building creating potential problems and increasing the workload of custodians. These measurements are also a useful to help with diagnosing and solving IAQ problems as they arise.

We can't recommend a particle counter model or brand. Nor unfortunately, can we point to a set of standards or guidance for particle counter measurement results. Similar to many other aspects of IAQ, there is no specific numbers that are recommended; it depends on a lot of different factors. Particle counters only measure the size and number of airborne particulate matter; the results do not tell the user what the particles are. Further analysis is required to identify the various particles.

In general, by using a particle counter, we look for indoor levels to be about half of the outside levels. Most school air filters will capture a high percentage of the larger sized particles most meters will detect (range of 0.5 to 10. micrometers), while more of the smallest particles (0.3 to 2.0 micrometers) will often pass through the typical school filter. It is unreasonable to expect most school air handing equipment and filters to capture all the particles from outdoors; however, comparing inside to outside helps establish the "source" of the particles. This allows the school to take necessary actions to control the source or provide improved air cleaning, and subsequently, verify reductions from these interventions.

Q: How often should you test carbon dioxide levels?

A: Carbon dioxide (CO_2) concentrations in schools provide a useful indication of the fresh air ventilation rate. As occupants exhale CO_2 inside buildings, the levels will of course increase. Adequate and effective fresh air exchange in the building will prevent CO_2 from reaching high levels. As CO_2 builds up, so do other pollutants, so a best practice is to monitor for CO_2.

Studies have shown that inadequate ventilation in schools is a common problem across the U.S. This may be attributed to many factors, such as old or improperly maintained ventilation systems, ventilation systems that are too complex for the skills of the operator, incorrect sensors and improperly designed/installed systems, and buildings with dozens of individual units that require attention beyond the time and resources of the facilities staff.

The simple answer to the question "how often to measure CO_2" is as often as is necessary to ensure the air exchange in the classrooms and school is sufficient, effective and reliable. Quarterly would be a minimum because in most climates the heating and cooling systems are started and stopped with the seasons and this often impacts the mechanical ventilation as well. We encourage schools to recruit students to make the rounds with an accurate meter as part of a science class or other school project. This activity provides real world experience to the student and saves facilities staff valuable time.

Q: Will EPA loan out air quality testing equipment to communities or schools that don't have the funding to purchase them?

A: The question of whether EPA is in a position to loan IAQ equipment is a question to be answered best by EPA program staff. It is our experience that school staff prefer to try out equipment prior to purchasing to make sure the devices are easy to use, provide useful information and stand up to daily use. Equipment suppliers often will have "demo" units they loan to prospective customers on a loan basis. We find that when school staff members get their hands on the basic IAQ instruments, they wonder how they got by without them. The bottom line is "you can't control what you can't measure" and "what gets measured gets fixed." Tracking meaningful measurements on a routine basis allows the facilities staff to keep building systems running efficiently, so the cost of the equipment is often recouped quickly through energy savings and proactive attention to maintenance.

Here in the Pacific Northwest, there are a number of organizations loaning instruments to schools and others to check indoor air quality. Some of the electric and gas utilities have loan programs so their customers can check for ventilation efficiency – thus saving energy while providing the correct amount of fresh air for the building occupants. Notably, the Washington State Department of Health created 17 IAQ monitoring stations for schools to borrow in order to document their baseline conditions. The stations feature meters that measure and record CO_2, carbon monoxide (CO), temperature, relative humidity, dew point and particulates. The stations are portable and also include a laptop computer for instrument download and analysis of the data.

Q: Is there a guidance sheet or resource that shows some of the ideal levels of indoor air quality measurements?

A: When it comes to measuring indoor air pollutants, it is important to understand that it is technically possible to measure far too many substances, compared with our current ability to set a limit on exposures to most of these in terms of human reactions. When you add this to the complex mixture of substances we find in buildings, you can appreciate our mantra: "only measure what you can reasonably interpret."

For practical and meaningful measurements, start with the *IAQ Tools for Schools* Action Kit (http://epa.gov/iaq/schools/actionkit.html) as your primary guidance document. The Action Kit is a comprehensive school IAQ resource that provides practical and effective guidance. Also, EPA, health departments and health districts provide factsheets on common indoor air pollutants you will want to consider measuring.

In the U.S., the indoor air quality and ventilation industry standard or benchmark document is the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standard 62.1. This standard provides specific guidance for ventilation rates, pollutant control strategies and some maximum levels for common indoor pollutants.

Green and Healthy Schools

Q: A school in my district overreacted because they saw that their onsite CO_2 detectors showed elevated readings. They called for a code green (disaster) event at the local health clinic and tested blood levels of some students. They recommended that anyone exhibiting any kind of symptoms be checked. What is your response to this scenario?

A: Is this a question about CO_2 or CO? We suspect CO, as we have never heard of checking a CO_2 blood concentration. Carboxyhemoglobin is what gets checked in the blood for CO exposure. The half life is six hours in ambient air. In an oxygen mask, the half life drops to two hours. If anyone passes out from CO exposure, they should be rushed to the closest hyperbaric chamber to be exposed to oxygen at three times the normal atmospheric pressure, which will reduce the half life to a half an hour. In other words, for every half hour that passes, the carboxyhemoglobin level will drop by 50 percent in the patient's blood. CO is one of the deadliest, sneakiest pollutants out there; you can't see it, smell it or taste it.

Q: Will you do a webinar for designers regarding ways to design buildings to maintain healthy IAQ overtime?

A: Two great EPA resources about designing buildings to maintain healthy IAQ are Indoor Air Quality Building Education and Assessment Model (I-BEAM) (http://www.epa.gov/iaq/largebldgs/i-beam/index.html) and *IAQ Design Tools for Schools* (http://www.epa.gov/iaq/schooldesign/).

Also, as a follow up to this webinar, on January 26, 2012, we (Rich Prill and Dave Blake) along with the U.S EPA's Indoor Environment's Division will hold a webinar titled "The Virtual School Walkthrough Webinar 2.0: Responding to Common IAQ Issues and Concerns." This webinar is designed to build on the general best practices and guidance provided during the December 9, 2011, Virtual School Walkthrough webinar by providing specialized knowledge on complaint response, diagnostic instrument use, and the pros and cons of air sampling. You can register for this webinar here: https://www2.gotomeeting.com/register/563344066.

Q: How can I obtain more IAQ Tools for Schools Action Kits? How many kits are needed per classroom?

A: One Action Kit per school usually suffices. Check out the newly updated *IAQ Tools for Schools* website, which now includes an interactive Action Kit (http://www.epa.gov/iaq/schools/actionkit.html). All of the checklists and backgrounders are available for download on the website. All of the information in the Action Kit is also provided on CD and these can be copied easily and inexpensively (no copyright). To get more information on ordering, visit http://www.epa.gov/iaq/schools/actionkit_text.html#Order.