IAQ Tools for Schools Webinar Transcription – The Virtual School Walkthrough 2.0: Responding to Common IAQ Issues and Concerns

January 26, 2012

Jennifer Lemon: Good morning and good afternoon to you folks. We appreciate you taking the time to participate in our 2.0 version of our Indoor Air Quality Virtual Walkthrough. Please don't worry. We're going to go through a couple of easy things.

You don't have to attend to the Virtual Walkthrough 1.0 to be at this one. I'm sure going to learn a great deal of information and our speakers are very knowledgeable. So if you have any questions toward the end, we will have a Q&A time for you to post those via our chat function.

We're going to go ahead, and I will briefly describe some of the objectives of this call, and then we're going to delve into a couple of logistics regarding the Webinar technology. Hopefully, if you're hearing my voice, you're in the process of logging on, so you'll be able to see the presentation that we're about to conduct.

So let's go ahead and get started. This is really going to be a Webinar that delves into the practical aspects of performing IAQ assessments. Our speakers are going to talk about really easy ways to communicate your assessment findings, both internally and externally, to your stakeholders.

We're going to show you some great pictures and talk about how to use IAQ instruments, how to do sampling—how to accomplish really a lot without using IAQ assessment instruments. So this will be a really great way for you to gain some understanding and knowledge about that and some practical solutions to take back to your IAQ teams.

Real quick, again, my name is Jennifer Lemon and the speakers you're going to hear from today are David Blake and Richard Prill, who some of you may know in your world via IAQ management, and they are a great team and a great resource to us. We really appreciate them taking the time to participate in this Webinar.

Just a reminder, we are recording this presentation and we will be archiving it on the IAQ Tools for Schools website. You'll be able to download the presentation and also have audio sync with that that you can access , and we'll have a question-and-answer document archived there as well.

You will receive a reminder that, since you've attended this presentation that those files are available on the Web at the time that they are posted, which usually takes around two weeks or so.

Also, as Dave and Rich will probably note in the presentation and throughout, they do have a website here that you can see where you can request a DVD copy of their virtual walkthrough presentation. This is all free. Once you have a copy of that DVD, you could also use it for your purposes to show to your stakeholders, as well.

So we're going to go ahead and launch a polling question to sort of get us grounded and to give us an idea of your knowledge and your familiarity with the IAQ Tools for Schools program and kit, since this is one of the foundations of our program.

So we're going to go ahead and open up the poll. Go ahead and vote. It shouldn't be that hard. Most of you are probably very familiar with the brand, and if not, it is certainly a great place for you to be getting some more information about the program in general.

OK, we're going to go ahead and close the poll and share the results with everybody.

So that's good. We have a good representation. It looks like it is pretty close between apply and guidance is certainly wonderful to see , and people who have the kit, you just haven't cracked that Ziplock and opened it up and started using it.

So hopefully, this presentation will give you some knowledge and definitely some motivation to start by.

Again, real quick, we're going to have another polling question. This relates to who's on this call. We're kind of just interested to see what kind of positions and professions that you are in, trying to get an idea of our audience and maybe this will help our speakers if they need to just speak to certain types of people that are on the call.

Really? That's good. OK. Really good to see that we actually have some teachers and administration staff, since I know this is kind of in the middle of the day for you guys. So this is good. OK, great, and good to see a good representation of state and local agencies, wonderful.

OK. Thank you for participating in those. We're going to go ahead and get started. We're going to talk about the IAQ Tools for Schools program briefly, and then I'll make sure to give David and Rich enough time to go through their presentation.

So I'll take a few minutes to review how the IAQ Tools for Schools program got started, the entitlements, and how it helps schools manage their indoor environment.

The program began in 1995 with the release of the IAQ Tools for Schools Action Kit. The Action Kit is an evolving resource that continues to be a strong foundational element of the program.

It provides best practices, walkthrough checklist, industry guidelines, sample policy and sample IAQ management plans to help schools and school districts to take immediate action to implement effective IAQ management programs.

The IAQ Tools for Schools program is implemented successively in tens of thousands of schools nationwide. EPA has learned what it takes to create IAQ programs that deliver the remarkable health and environmental results schools seek.

And also with those programs, there are potential mentors and programs that you can also use for guidance and helpful resources to use as you get started or move forward with the current existing program.

EPA organized this knowledge into a framework of proven solutions for effective school IAQ management. This framework provides a common language to describe the drivers of IAQ program's success; offers detailed guidelines on approved strategies; offers organizational approaches; offers leadership styles that are fundamentally effective; and presents a clear vision of the top IAQ excellence.

Its highly flexible and adaptable structure allows any school, regardless of location, size, budget, or condition, to use the framework to launch, reinvigorate, or sustain an effective IAQ management program.

By applying a cycle of continuous assessment, planning, action, and evaluation, the six key drivers work together to deliver effective school IAQ management programs, but also can be applied to other management systems within that school district, as well.

The six key drivers are as follows:

- organizing your program;
- communicating with everyone all the time;
- assessing your school environment and how occupants are doing continuously;
- planning your short- and long-term actions based on your assessments and other important factors;
- acting to solve or prevent IAQ problem; and
- addressing structural, institutional, or behavioral issues and evaluating your results and the impact of your program for continuous improvement.

The Six Technical Solutions has defined the most common issues that schools need to effectively manage IAQ risk. When addressed systematically and aggressively, an IAQ program that focuses on the six technical solutions will deliver a healthier school environment.

Now don't be frightened. I know this is a lot of information on the slide, but we've really just been able to get it down to six of these to cover most of the things that are relatable to an indoor school environment.

The Six Technical Solutions are:

- insuring quality inspection, operation, and maintenance of your HVAC system;
- active aggressive control of moisture and mold;
- strong integrated pest management;
- effective, consistent cleaning and maintenance activities;
- smart, low-emitting, low-toxicity material selection;
- and aggressive source control, for example, your anti-idling school bus policy, radon testing, or proactively managing your school's chemical inventory.

These solutions will be the heart of the technical information Dave and Rich are about to cover.

OK. Onto another polling question. So just to give us an idea, we're curious, are you currently using air testing instruments? And it's OK, these are all anonymous. We're not "yay" or "nay" on them. That's why we're here – to provide this presentation and to go through the options that you have.

OK. Wow. This is different than what I expected. So Dave and Rich, I'm sure you can see this is well, and it's pretty impressive to know this. So 38 percent of us are using a variety of instruments to assess IAQ. That's good to know. OK?

Next, another polling question. So that's great that you use this equipment. Hopefully, you're sharing these results internally or externally , and , and we're curious how you might go about doing that. So could vote for me, please?

Great, this is really good to know. No one's keeping everything to themselves, not really. So we're all about communication. Like I said earlier, communicate all the time with everyone.

OK. One last poll and then I will turn the show over to Dave and Rich. So with this IAQ management that you're doing and using these assessment tools, do you have a formalized communication plan in place?

OK. This is looking good. So a lot more people have it, I think, than predicted. Great, OK. So that 28 percent that you don't have a formalized communication plan in place, maybe you can be a person that spearheads it and we'll go ahead and this Webinar will help you get one started.

So without further ado, I'm going to pass it over to Dave, and I'll let you guys get started with your presentation.

David Blake: Great. Thank you, Jen and EPA headquarters for inviting us to participate in this Webinar today. Let's see if I have control yet.

Jennifer Lemon: OK, you're in the driver seat.

David Blake: OK, great. Thank you, everybody, for attending today. Welcome. Rich and I have a couple hundred slides to go through today , and as Jen was saying, this is really going to be a sequel to our first presentation that we did many years ago at the National Tools for Schools symposium on the virtual school walkthrough.

Since a lot of people haven't seen that first one, there will be a brief review of the walkthrough before we get into our talk, and I want to remind you that this disk is available. You can contact me or contact Rich. For as long as we can afford to, we will send out free copies of that.

So we're going to spend some attention today on the no-instruments angle of doing a walkthrough, and that ultimately will lead the way to doing a walkthrough again, instruments using the testing of pros and cons.

Here we go. So thanks, Rich, for all that.

Basic walkthrough: the idea is to get a baseline of current conditions. I know I got a notice from my vet the other day that my cat had to go in, and there was a little notice on that card that said the idea is we want to get some testing on your cat for a baseline to compare to down the road. If there are any problems, we can see what has changed.

And that’s the basic idea of doing a walkthrough, too, is finding out how your school is operating on a given day under normal operating condition.

David Blake: So what we want to do is reduce exposures to outside discussions, talking our way through the school and observing and making notes, basically, without instruments, and using our senses.

Walkthroughs send a positive message to staff and parents. For those who don’t know, that’s me with my eyes closed, looking at this crowd…Rich went into a class and said it’s good to have a picture of speakers so people can figure out who’s talking. Well that happens to be me there.

So we sent a positive message to staff and parents that we didn’t barge into the school and force our way in. We were invited. Please come tell us what we can do better.

When you do your walkthrough, you want to let people know that you're coming in advance, so that they know it’s a proactive visit. This is not a response to some crisis, and that way, you don’t have to explain yourself classroom-by-classroom. It’s good to have a local team member enter first in the classroom so you don’t freak out the little kids.

We get really good positive feedback from the teachers. They say things like, “Gee, I taught for 25 years and this is the first time anyone’s come in to my classroom to see how the conditions are.” This really is a positive message to the staff and students.

You want to visit during occupied hours because you want to get inside and to look at what is actually going on in a fully occupied school in normal activities, and we’re very briefly in the classrooms—5, maybe 10 minutes if there's something special you want to take a look at.

And we all save the classrooms for last.

Walkthroughs help facilitate staff learning essentials through “scrape-hands-up” training, and it’s invaluable really and hopefully the walkthrough

identifies the school's unique challenges and promote good practices. That's what it's all about.

We have a hard time prying some of our basic instruments out of their hands when we're finished, because they immediately see the value of measurements and monitoring, and we also want to make sure it's a non-threatening approach for the maintenance people. We're not there to point out deficiencies or make them look bad because they overlooked some things. So it's a learning opportunity for everybody.

So we're comparing what we see to competence benchmarks as it dries; it's clean; it's comfortable; it's controlling the pollutants that you become aware of; and it's a place that is really well-ventilated.

The idea is that there are very few real standards, guidelines, or regulations for a lot of the pollutants we see in our buildings, in our schools, and so we use these five benchmarks as sort of a complement to the EPA's Six Technical Solutions. We've rolled it down to five.

But the idea is that buildings are dynamic. They're all different. They're all unique, and by looking at basic benchmarks, those are things that you need to look for in context with that particular situation.

An important occurrence there we want to walk through is paying attention to airflow direction. We want air to move from clean to dirty and then outside. So, for example, we want air to move from the classroom into the shops, and then outside; from the library to the chemistry lab, and then outside.

Another example is that you want to make sure that air is going in to the chemical store room and not coming out. Now we're talking about not using instruments. This is a $50 instrument here that can come in very, very handy. But even without the chemical smoke, there are other tricks to the try: tissue paper works, to check to make sure exhaust fans are actually sucking air and not just making noise, for example.

I mean, this isn’t high-tech stuff;I think it’s the least that we can do for our occupants. We call it prudent avoidance. We know there’s a source. We want to make sure that doesn’t reach the people for exposure.

We’d like to make fire escape plans so there's a map of the building. We can make notes on it. It’s good to know, room-by-room, which way air is flowing. Is it from the hall to the classroom or vice versa? And write those errors right on the map, and they could come in handy down the road when you get an issue, and be sure to note the date.

Ventilation’s very important, too. Without instruments, what you can do is just ask, what is your ventilation strategy? What equipment do you have? And how do you assure that you're getting adequate ventilation to the humans in the school there? And just document that, because the lack of fresh air, we know, can impact achievement. Studies have been done.

Start your walkthrough outside, typically, and you want to look for outside sources, things that are outside that can get inside, and just make a note of it because we know what’s outside gets inside, and what’s inside builds up.

You know, what you're breathing indoors is outside plus whatever’s going on inside. So outside, it’s as fresh as the air can get inside the school.

So when you're outside, look up and note things, in this case, the roof scatters running water down this concrete wall, which we know is just a rigid sponge and that’s going to wick through, so make a note of the outside on your building plan there. So you could look on the inside to see if there are any problems manifesting themselves from that moisture intrusion.

And you want to look well. You never can tell what's going to be down there, especially for things like access to pests. You might as well hang the ballpen sign the outcome. You got a big, gaping hole like that in the outside of your business in your school.

Check your air intakes. You want to make sure that they're clean. In this case, we have a filthy air intake that actually got spray painted over when they

painted the building and that explained why there was zero fresh air getting into that building. Good thing to check when you're outside.

Get up on the roof. We're not asking you to be a mechanical engineer, but just look around and ask questions, familiarize yourself, you know—how and where are the filters? How often are they changed? Are they gusseted into place?

This gives the facilities people the chance to show off and explain what they know, and sometimes, it's a good check to see if they're paying attention.

You can see other things, I ask questions – why are these outside air dampers closed? There might be a good reason for it. That's where the fresh air gets in. You can look for possible re-entrainment of combustion gases. In this case, those stacks are pretty close to that intake, and it's possible that under the right conditions, flue gases can be sucked right back into the building. So just make notes.

And then from outside, you want to check and see how your defenses are keeping dirt from getting in to the school. Is it muddy? Is it wet? There are plenty of concrete and walk-off mats, you want to look for at least the three-stage dirt control, but get the big stuff up and then finer and then finer as you finally get into the school, hopefully with pretty squeaky-clean feet. If you do this, you don't have to chase dirt all over the school as much.

We want to have somebody with the key so we can look everywhere, say, "What's on top of that ladder? We never go up there. Well, let's take a look." You never know what you're going to find, and just make notes if you see something that's a little bit funky. Now this may work. Have a little plastic bag in the cardboard box to catch the drip, but maybe not forever. Just make a note. You don't look, you don't know.

Work your way, first, through the offices; work room; staff room; vent again… we're saving the classrooms for last, right? Make note of big old copiers that are not vent to the outside. You can see this is not staged shut. That's what a big old copier can make you feel like there.

Unvented laminators? Make a note of that as it pollutes and the source may need to be dealt with. Check the storage custodian and mechanical areas. Just make notes. The chemical smoke you can check to make sure that your combustion zones are actually going up the flue the way they're supposed to, and not back-drafting into the building with other pressures.

Polling, somehow, gather on the fluid and polling combustion gases back into the building. Just make a note on custodial, you know, are they into green cleaning or do you still have a hundred chemicals playing around?

Make note on the technology in use. Is it ancient technology or are we getting into the more modern opportunities that we have available for us these days with some of the high-tech cleaning supplies?

You want to take a look at the labs and chemical storage. It’s not going to be time to get into great detail when you're there outside doing a walkthrough, but note, obviously, unsafe conditions like this. So if you see something like this – improper labeling, metal something – don’t smell. Good thing to make a note of.

See that the kilns are vented. There’s a lot of potentially toxic stuff coming out of heating those glazes. You want to make sure that that’s getting outside and not reentering back into the school.

Now, in the classrooms, if you don’t have instruments, you want to at least look for the supply. This is a unit ventilator and the fresh air comes out the top, and in this case, it’s going to be hampered a little bit because a lot of horizontal surfaces end up turning into shelves in the school classroom.

At least document whether the system is on. Is the air turned on? While you're there, write down the number of students in the classroom. Is the system on or off? Windows: opened or closed? Doors: opened or closed? Make notes like that, room-by-room.

So people catch on and put signage or cover the vents or you don’t always get the cooperation you need, especially if it’s a little chilly and there's a movie on in the classroom.

Make notes of custodial. Our custodians, have 5-10 minutes to do a classroom, and I don't believe I've met the district yet that has a budget for just routine dusting. So that takes some teamwork. But at least make notes if things are building up, and you clean this classroom? Make note of it.

That cozy corner, or from our perspective, a seething nest of potential asthma triggers, just make notes of non-district furniture and rags and stuffed toys that may be an issue in terms of hazarding triggers that can be released when they're disturbed by students and staff.

Richard Prill: When I see that picture, Dave, I just – I just get the creeps of an A-bomb of pollens and asthma triggers coming out of that fuzzy stuff.

David Blake: So that voice has just got here. That's Rich.

And in every classroom, we're looking under the sinks. It's amazing what we find, you know, literally open ammonia next to open bleach in an elementary school classroom under there. So you want to make sure that it's all district-supplied stuff that's under there and that it's safe. Just make a note of it.

Note moisture issues like this obvious, current, wet, dew in tiles and active mold growth. Spot-check the mechanical. We don't look in every mechanical system in every room, but take a peek and see how things are doing.

You can see here that that filter is just kind of tucked in there, and it'd be pretty easy for air to just bypass it. This is a little bit funky here, too. Above the fiberglass, it's going to get trained in the airflow. Just make a note.

When you're done with the walkthrough, summarize all your findings and sit down with the walkthrough team and the administrator, if you can, for a few minutes, and let them know what you find – emphasize the good and end with the bad, and/or not so good.

And, make sure they understand the significance of what's been found so you rank priorities and set appropriate timelines and get fixes lined up, and then hopefully they will follow through and document what they've done, and then

post all of the results in the staff room so it's an open book, anyone can find those results in the curve, and somebody can explain them if there are any questions.

It’s very essential to do communications after you make an appearance in the school, because people are going to want to know what you found, and bad news only gets worse with time. So you need to post that immediately and say, “Well, honestly, here’s what we found.”

And you take what you find, and you can institutionalize the good practices you already have in place. Rich kind of boiled the Tools for Schools kit down to a 3-step program for implementation, because some people found the box a little unwieldy, to start with, right?

And so these three steps are:

- Number one, name an indirect quality coordinator or a go-to person
- Number two, do your walkthrough
- Number three, you can select from these menus. What he has are all these different menus for about 80 items, that you can just go through and select from and say, “OK, we’re already doing this? Why are we doing that? We want to do that.”

And just create your program off that menu. You know, you can start with a flexible program and build on that program. This menu has a program in place that will hopefully improve over time.

So you’ve done your walkthrough. You’ve got baseline conditions documented, and you selected policies and guidelines for your formal indoor air quality program, and you're set and up and running and the school continues.

But, sometimes, things still happen. Change happens. You can have an issue come up, and when that does and you need to respond, that’s one of the things you want to highlight today: how to respond to issues when they come up.

How do they come up? Well, sometimes, you learn about them the hard way. You need to create an environment where it’s comfortable for people to voice

their opinions. You can get these underlying messages. They aren't as verbal. There are more messages from the occupants, right, that they have some issue with what's coming out of the duct work over their head.

So like this, you want to make it easier for people to complain. You want to sellout and emphasize that each request will be carefully considered. You can do it that way or this way—what we would recommend is making it very easy and comfortable for people to do the favor of letting you know up-front there's a potential issue before things get really bad.

Richard Prill: And we don't like to use the term complaint. We like to use the term of either a comment or a suggestion or an issue.

David Blake: That's like him. It comes up the road here.

So when an issue comes up, you want to get right on it because that clock is ticking. Occupants can get emotional. Time keeps passing and nothing's happening. The rumor mill gets going, trust can be compromised, and possible solutions couldn't get more difficult and expensive, especially the moisture issues if they're not being dealt with in a timely manner.

Our experience is that the longer a problem goes on, the longer it takes to solve it, and the more expensive it gets. So you can see, as Rich is saying here, we don't like that word complaint if we could avoid it, because people don't want to be complainers. They don't want to be labeled as a whiner.

Typically, when people do say something, they're at their weak fin and they've waited sometimes too long to voice their opinions. So encourage commentary and get right on it, get the facts from whoever has their issue, do an immediate interview just as quickly as possible, and note down who is affected by the issue; what's the nature of it; where is this happening; when does it happen? So you can try and figure out if there's a pattern to help you solve the issue.

You don't want to be this guy.

You want to get the quick, initial response, as they say. Be there, show your face onsite, and demonstrate that you are on it. That goes a long way to starting a good response to a report of a problem.

We can look at buildings but we're not qualified to look at the humans, you know. We're not doctors. You know, doctors do that work and ask people and you can get their permission and clearance to get this information because it's private. But it's available. We'd like to know what tests, medications or recommendations have come from medical staff to the person that's affected by what's going on.

You want to get more facts. It's good to have an occupant diary, encourage whoever's having an issue to keep the diary of when is it happening, what are your symptoms? Because in my point in arrow to what's going on? A lot of those forms are available on the EPA website, www.epa.gov, in the building air quality manual.

Once you've done your initial interview, you'd want to share that with the key people that are going to be involved with solving the problem – principals, custodial staff, facility staff, your indoor air quality coordinator, and agree on what you're going to do.

You want to have measurable outcomes that are realistic outcomes. For example, you're going to make sure that ultimately this conference within the guidance for recommended temperatures, relative humidity, air velocity, air movement. You're going correct the airflow direction if that's a problem. Lower carbon dioxide levels by increasing ventilation. You're going to have more look from reduced noise or reduced airborne particles. These are all measurable outcomes of a situation getting better.

First is agreeing to test for every living thing under the sun that could be going wrong in there including chemicals. That can be prohibitively expensive and really unrealistic and may not get you where you want to go anyway.

So initially, at least, the outcomes and target that you're looking for with your investigation is to reduce health effects, reduce absentees, reduce irritation,

medication, reduce distractions, and should you get a long way towards solving your problem to at least agreeing that it's been solved.

Now I'm going to hand the torch to Rich and maybe I'll have some commentary on what he's passing along.

Richard Prill: Thanks, Dave. That is a good walkthrough orientation. I think people get the idea that you need a look. You need to discuss things with people.

Let's look into inspecting a building. Dave and I go out to a lot of buildings proactively. But when we're there, usually people have an issue and they want us to take a closer look, and we call that an inspection, and when we inspect a building, we look to see what's changed.

You know, if problems just started occurring, there's a reason for that, and we try and find out what is different. Did something stop working or pollutants brought into the building? Is there a leak somewhere?

So we try and identify what is changed and we look at those five benchmarks or the Six Technical Solutions from EPA, that, you know, which one of these things could be the issue. Is it the comfort issue? Are there pollutants that are breeding in exposure? Did something happen with the ventilation system?

So we look at those benchmarks just to keep it simple. This is not a science project. It's a basic way just to look and characterize that situation.

We want to take a closer look at everything in the room. We don't want to just spend a few minutes in there. We might want to look really closely.

Here's a school counselor that was having a chronic irritation, and now we look closer in her room we find that there was actually fiberglass behind every one of those boards on that panel and once that fiberglass was cleaned up and the exposure reduced, she was fine. So we need to take a close look at what some of the issues might be.

We use low-tech at this point. We don't turn it into a science project where there is some fiberglass lying on a shelf next to the coat hangers and the

Kleenex, which poses a hazard to the eyes. I think most of us would suggest that that's not appropriate.

You can use your high-tech wrist watch to check out a low-tech time clock, to see when you had a power outage or daylight savings time kicked in, the time clock wasn't reset. So again, we're sort of doing a Sherlock Holmes thing, if you will, looking for the clues.

This is Dave doing a sniff-test on the carpet. If that carpet smells like a wet dog, it might be that it was cleaned and extracted, but was not dried quickly enough and contributing to bacteria and mold growth. So sniff test, maybe that's part of the issue: chemicals, other problems in the building that maybe were forgotten about. So just use your nose.

Here's a floor drain. For some reason, it's got carpet around it, so I'm guessing they don't mop that very often, and if that's allowed to dry out, then we get a direct connection to the sewer system, and that can be a problem in our building. So now you walk in and you smell sewer gas, check for dry traps, dried floor drains—pretty easy for that to happen.

We listen. We not only listen to the occupants because they're going to point out things that have changed or something that they're suspicious about. So if the motor sounds different than it used to, perhaps it's not working anymore. It's just running free, wasting energy.

So listen, feel, touch – use your senses to find out which way the air is going. Like Dave mentioned, there needs to go from clean to dirty to do prudent avoidance of exposures, and if air is coming out of this zone into an occupied zone, I think you have some real problems.

So in order to know what children are being exposed to, like asbestos fibers at a young age, you really need to check these airflow directions and you can do that with a tissue paper like Dave showed with the exhaust fan. You don't need high-tech equipment.

You need to document what you find as you do your walkthroughs, because documentation helps. You can see that air was going the right direction and that’s fine, but in January, now we have an issue in this particular zone.

We look at the airflow now, and we find that instead of going the right way, it’s now going the wrong way by reversing those airflows, going back into the restrooms instead of coming out; going back into the Home Economics instead of coming out; going back into the Science away from the Business Ed.; we’ve got a problem to solve.

So basic documentation and low-tech approaches can make a big difference.

Use the white-glove or black-glove test just to check for custodian cleanliness, exposure to particles, and whether the particles increased or decreased. So we need to ask some questions here to find out why we’re all of a sudden having a lot of the part of it – particle exposure.

Most of us can't get a hold of a flashlight in the ladder so we look above the ceiling tiles. The ceiling tiles might look fine, but you might be surprised what you'll find up there. You can look under my right elbow, there’s fiberglass installation right on top of the ceiling tiles, and of course, there's lots of linear foot of cracks and openings in those ceiling tiles in those trays, and of course, that fiberglass can easily reach the occupants.

You might also find moisture damage or hidden damage behind the ceiling tiles. So take a look at top-to-bottom, inside and out, and take the extra time to be thorough as you can.

Don’t be afraid to get dirty. But you need to be careful. Don’t stand on top of the ladder, but be as thorough as possible. Protect yourself if you're going in places that you know can be contaminated or there could be some exposures. Use your good N95 respirator and tie and suit and gloves. You don’t want to expose yourselves to some of these hazards.

Make sure you find out what's in the space before you go in there. This person was led to a tour and it turns out the space was highly contaminated with

asbestos, not something you want to find out about after the fact. So do your homework, make sure you talk to people.

Comfort is one of our number one issues we run into as we go to schools, we find out that people have a lot of concerns about their comfort – either too cold or too hot, or both. It's cold in the morning, it's hot in the afternoon or vice versa.

So systems can be complex and we need to deal with comfort because it impacts health, performance, achievement, and retention of good teachers. We don't want teachers to get fed up and move on to a different school.

So look for comfort—again, the Sherlock Holmes approach. You look for the basic clues. This tells me if there's something going on in that space. It's going to be an energy issue also. So people using a lot of extra energy to make up for a deficiency in mechanical system, and that's a losing game.

You don't have to be an engineer to understand that if you out a heat source underneath the thermostat, or a computer next to a thermostat. You're going to fake out the system, and the thermostat is going to say, "oh, it's warm in here. We don't need to provide heat." And you need to help the people with the obvious, common sense.

You have a lot of moisture in your climate, you need to look to make sure that building drains the moisture away. You don't have puddling or potential entry points. Again, low-tech approach. Some molds and moistures may not be obvious, so a pretty low-tech approach is to cut a hole and get your flashlight and look in the wall cavities or in the various interstitial places to see if you have some water entries and moistures and condensation.

And, a super low-tech approach is to cover those little holes with a blank switch plate. You know, for less than a dollar, you can get one of these and you don't have to deal a lot of pain in your patch up, and you have an inspection hold for the next time.

Obviously looking around, did the mold flue get wet? Well, we know that the way to grow mold is bad water. If we keep our buildings dry, we don't have to worry about a mold issue.

We don't need high-tech sampling to look underneath the floor mat. This is in a wrestling area, weight room, and obviously that concrete was leaking moisture from the soil and creating some potential exposure to bacteria and molds.

Team up with the experts in the building, you may have a mechanical system that's fairly sophisticated, get your most sophisticated operator to give you a little demonstration and to take a look and see how things are supposed to work.

And, you want to not only ask about it, but you want to trust and also verify. There's a computer, as you know, garbage in, garbage out. The person may say, "Well, gee, it looks like it's working." But we going to go and check it out, because that motor may be working; it may be running; maybe using energy; it may show up on the computer as working just fine; but if the fan belts are loose, you can see that there's no airflow using that low-tech chemical smoke.

So you need to test and verify the sophisticated computer systems. Here's some linkage. Low-tech linkage came loose. The computer says, "Well, that system seems to be working OK." But you need to go look and verify.

Inspect the outside area intake, people in the classroom suspected that they didn't have enough fresh air. It's stuffy. Students are sort of lethargic. So we go outside. We open up the outside air intake grill, take a look at the dampers, and you can see that they were slammed shut and using kitchen griller tools, we were able to solve the problem.

So we listen to the occupants and we respond with a low-tech approach, best we can. In the case of a stuffy classroom, I always look at the intake, and we find a lot of airborne debris was plugging in that intake. So it took a screwdriver and a ladder.

Use your eyes and common sense. They put in a new gas-heating unit but they put it right next to the air intake on the unit on the right, so we were getting combustion into the school. I don't think we need to measure that in a situation. We need to correct the installation.

After you do you inspection, again, we want to summarize the findings. We want to make sure we advertise that, everybody in the school that, "Here's what we identified. Here's what we saw. Here's what we suggest for solutions."

We want to agree with the occupants that this is the approach to take. People are much more likely to go along with solutions if they help design those solutions and by offering them. So you avoid that, sort of labor management issue whereas Robby told us we're never going to do this but we don't think that's going to work.

So agree on the approach. Keep everybody informed as you move along with the actions to be taken, and then verify that you actually problem – solved the problem. You don't want to declare a victory and go home and still leave some issues behind.

Let's look at some basic measurements that we think most schools should think about adopting if possible. Measurable outcomes are very essential. They can confirm or rule out the cause of some issues.

We want to make sure the building is really the building that's causing the problem and not some medication or some other issues that the occupant has going on. It helps you dial in the remediation so you don't overreact, and also verify that you've been effective in your solutions.

What gets measured gets fixed. We only measure what we can interpret. So exotic measurements oftentimes are pretty hard to explain and understand. So we want to communicate with people that what we're going to measure; why we're going to measure it; and what we'll do if we do find some issues.

This is out of a newspaper clipping. Three-quarters of a million dollars and they're still a mystery, and the fine print says, the teachers union sued the district for IAQ report that the district said it's not a public document.

Well that fosters a lot of mistrust and rumors, and I think, the way to deal with a mystery is to get the facts and understand more about what's going on. So we solve mysteries with information.

One way to get information was to assemble some of our basic tools. This is a walkthrough kit that I used. It's got some elaborate instruments but I think for most schools, you should have the temperature and relative humidity meter; some of that tracer smoke that Dave mentioned to look for airflow direction; carbon dioxide meter to look at ventilation. That's very essential.

Carbon monoxide meter might be good if you have a lot of combustion devices in the building. Moisture meter is essential to keep the building dry and locate water leaks before they turn into mold farms , and a light meter is nice to look at the lighting, because lighting affects performance and eliminate takes, and glare and other issues that could be health effects, so basic walkthrough kit.

This is a really important slide that I want to spend a minute on. We need to discuss our indoor air problem with the people and make sure it's building-related and not something that dissociated with the occupants' ongoing health issues, related to hobbies, or chronic conditions.

We know that the indoor air quality is affected by the pollutants that people are exposed to. So we need to control those pollutants, identify them and have a strategy to keep them out of the building or keep them contained.

We contain those pollutants by closing off pathways that allow the pollutants to reach the person, which could be a hallway. It could be an open door. It could be a ceiling plenum. It could be a duct, and then air moves for a reason. It moves because of pressures , and that's what we use to smoke tube for. It's to make sure that air is going the right way, avoiding exposures.

So using those three parameters, you can look at this slide and we've obviously got some sources we got acids and flammables. We know the source. We contain it inside these cabinets so we close the pathway, and then we run the exhaust fan to change the pressure so that those pollutants go outside.

Taking a look at the school, here's a contaminated cross base with moisture, it is full of water. It's got contaminants in there. We could take the difficult path and sanitize that but that would be pretty expensive and take a lot of time.

So what we would do is instead of removing the sources, we've closed that pathway, seal that cross base up, and then we would change the pressure with an exhaust fan in that cross base so that we deny that air access to the building.

So air goes from the building to the cross base, and to a safe place outside. So using that triangle helps us a lot. Air goes where it's supposed to pull, as Dave mentioned. We can check that very easily with a smoke tube, make sure air is going the right way in our different zones.

If that zone is positively pressured, so air is going out or air is going in. If you've got contaminants in the space or if it's neutral and you really don't care, we use pressure gauges. These cost a few hundred bucks but it gives you a chance to do documentation of what the pressure is in the zone compared to the zone next door.

So here I am measuring the inside of a classroom compared to the Drama storage where they have paints and clothing and other props they use in Drama, and I'm looking at the pressure, that will tell me which way the air is going, but it also tells me how robust that pressure is so that I can get an idea of just how reliable that air flow direction's going to be.

So we measure in the room compare to the other space using those tubes on that pressure gauge. The pressure gauges in the pressure measurement really help us solve a lot of issues. Again, this goes back to sort of, the Sherlock Holmes thing. Let's map it out, see what the clues tell us.

Here I am talking to a teacher with some issues, and we're looking at the pressures in their room compared to adjoining spaces, and you're answering the question, where does the air come from that's coming into this room? What am I breathing? What are we being exposed to? So you can see here, this just goes back to like Dave's slide of "air should go from clean to dirty." You can map that out, take a look at it, share the information.

We'd like to see, if you got a lot of contaminants in a room, like the Physics or Science storage, chemical storage, or a contaminated cross space for instance, we want to see, maybe even 25 Pascals of negative pressure to really make sure that that's going to keep those pollutants under control.

And 25 Pascals is a very strong pressure for this contaminant control. You can see it's about 1/10 of an inch of the amount of pressure it takes to raise water an inch in a straw. So about a tenth of an inch is all the pressure we're talking about, so not huge pressure.

If you've got some really contaminated zones, here's a room of asbestos. You certainly would want to be careful with that air be getting after the occupants. You would want to document that so you wouldn't have any future claims of exposure.

Someone that gets lung cancer down the road and says, "Well, my room was next to that place." You can document that and say we've got records that show that that air was always being contained.

Using the pressure gauge we see in this particular situation that that ceiling plenum was pressurized compared to the room , and it had lots of fiberglass above those ceiling tiles, so not only was gravity working that the pressure was pushing the air down to all the cracks and openings and delivering a lot of fiberglass exposure to the occupant.

We can measure airflow with the flow hood. These cost a couple of thousand dollars. Balancing contractors use those a lot. For a hundred dollars, you can get a flow meter that is very simple to use as a pressure gauge and this will measure your exhaust fans. You can see if they're moving the amount of air

they're supposed to move, so good basic measurements that allow you to make sure things are working right.

Now, I think this is one of the essential tools for a lot of schools. It's a way to check for air exchange and we know that buildings need to breathe. We want to keep our carbon dioxide levels below about a thousand parts per million and most of that occupy spaces.

And, if you do that, that means you're getting about 15 cubic feet per minute of fresh air per person. So the more people, the more air you need. The less people, the less air you need to bring in, and the carbon dioxide meter will give us a good indication of that.

You can see in this little chart that ideally, we want to be in the 800 to 1,000 range. If we're below that, we may be over-ventilating which could create a big energy cost if it's really cold or hot outside, and if it's under-ventilated then we've got a potential for more exposure. We're letting things build up. So we like to be in that sweet spot.

Unless it's a really mild day and you're not going to spend a lot of money or energy conditioning the air, then bring it on. But, during severe weather, cold climate, hot climate, we want to be careful not to over-ventilate, and this meter helps us dial that in.

So as CO2 builds up, so does everything else and we know everything else is going to be too difficult to measure and interpret, so if we have a good air exchange, I think we can rule a lot of other issues.

So we check outside to make further reference and it's usually 380 to 400 parts per million outside, in most locations, and then we go into the school and measure the breathing zone after the building's been occupied for most of the day, late morning, afternoon is a good time to sample.

Dig what we're getting for carbon dioxide build-up. We check to see what's coming in from the air handling system. If it's the same value as what's in the classroom, we're not getting any fresh air mixture.

So we want to see that, you know, under 800, for sure. If it's cold or hot outside, you don't want to have a hundred percent fresh air, perhaps. So it's a good way for the maintenance people to dial this right in and be energy efficient and provide fresh air.

This teacher turns off the air-handling system because of the noise and of course, that turns off the fresh air, and we all suffer. These are six graders that were affected by high CO2. They just couldn't pass their test, so they were left behind.

David Blake: I need a back track, Rich.

Richard Prill: OK. You get last, Dave.

David Blake: All right, I just did.

Richard Prill: Data recording meters, these cost a little bit more money but it's really valuable to be able to record things when you're not there.

So the facilities people don't have time to stand around and watch a meter move. So we can set these up and let them run for a week or a day, and we can find out what's going on minute-by-minute.

And you can see in this classroom, the CO2 concentration on the left-hand column there, and then I've got a dotted line across the middle that shows the start target of about a thousand.

And you can see that the students are breathing and the CO2 is not being carried away, and I don't know how high that would go if they hadn't gone to recess or lunch. So it really gives us an idea what's going on minute-by-minute during the day and that can help us solve the issues.

We want to communicate. We want to explain what these numbers mean so people don't go home and talk to their spouse about a thousand parts per million of carbon monoxide. So we have a quick chart that we show people and explains what we want to have in the room.

Carbon monoxide is a really valuable meter if you get combustion devices in your building, because you don't know when those are going to break or act up or fail. So we have zero tolerance for carbon monoxide, it should be no higher than what is outside.

Back-tracking can happen due to negative pressure. Again, air should go clean to dirty, and when you've got a negative pressure in the building, it can actually prevent fumes from going up the flue where it's supposed to go.

We used moisture meters. These cost a couple of hundreds of dollars but they basically look in the wall cavities and look at surfaces to see if their damp or wet, so they're very essential to keep our buildings dry.

A place that a lot of people don't look is underneath these chair mats and the concrete can whip the moisture, and we find moisture underneath the chair mat. This is Dave checking under the chair mat in the principal's office.

You can see the bull's eye from the moisture that is accumulated, and of course, it smells like bacteria and old gym socks underneath that chair mat. So whenever you roll your chair across there, you're getting a little dose of that.

This is a very inexpensive concrete moisture test kit to find out if the concrete is wicking moisture, so you can take action, or at least not cover it up so it grows things. Another moisture meter checking for moisture content, again, just add water, just add moisture, mold is going to grow and you're going to have a bigger problem.

So meters are very important to rule things in and rule them out. Using thermal imagers is more and more popular. These devices have come down in cost. They're really valuable for a lot of uses in schools, probably, outside the budget for some schools, but, something to be thinking about.

You can find hidden moisture in wall cavities. You can find energy waste issues and safety issues. So this is a high-tech instrument but very, very valuable.

You want to measure temperature and relevant humidity and the dew points, so we don't get condensation inside the wall cavities where we don't see it – little molds. So these devices are a hundred dollars or so and very essential to rule things in or rule them out.

Light meters are valuable. They don't cost that much. We're going to need to have proper lighting, not only for energy efficiency but for performance achievement, and to avoid headaches, nausea, and fatigue from poor lighting.

Noise is a problem, so we want to make sure we can either measure noise or at least use a team approach to say, "You know, this is a lot louder than the rest of the classrooms" or "that rattling HPAC system or mechanical system really needs to be fixed."

So we don't want to put up with a bunch of noises in our classrooms. Because this is what happens, people take matters in their own hands, and then they block the airflow, and then, we've got multiple problems. So deal with the noise.

We can also look at dust and airborne particles. This is the particle counter and we can compare particle exposure and problem rooms compare to other areas. If all the rooms are the same, it sort of rules out the fact that maybe that's an issue.

We compare outside to inside. If we find a lot more particles inside than outside, it suggests that they're being generated inside and we can go and find the source of the particles and clean that up and reduce exposures.

So if we look for less particles inside, we can measure the filters are working properly by looking at what's coming out of the registers. It might be that the ducts are coming apart, and some of this duct lining could come apart, and that can be the source of the exposure.

We look at our vacuums. It's amazing that even the top-dollar vacuums really spit out a lot of particles at the back side. So you want to make sure that they're being maintained, you have good bags, and they actually do capture

the particles rather than just pulling them out the carpet, and make them airborne for more exposure.

This is a close-up look at the particle counter. You can see we're measuring six different sizes in micrometer, and all the zeros suggest we're not getting any particles out of this air cleaner. So that air cleaner works. That's a good thing. All zeros.

This air cleaner's not working properly. You can see all the particles that are coming out the air cleaner. So basically you're just wasting electricity by running that air cleaner. Something needs to be fixed.

So we try and meet recognized parameters. If you don't have measurable results, then people can ask for anything, and you're never going to satisfy some people. So you need to agree on some measurable outcomes.

These are comfort charges and so forth. You can say, "Well, how about if we can get you right in the middle of this recommended comfort chart." And get people to agree to that, and then you know when to stop. Otherwise they can say, "Well, it's not quite perfect yet." So measurable outcomes are very, very important to get closure.

You want to post your measurement results. Here, you can see we posted the CO2 results. We've talked about fixing the exhaust fan. We noted that the carpet was extracted two times. They switched to spring cleaning products.

So keep everybody informed on what the measurements are, and what the fixes have been.

Now, I'm going to turn this over to Dave. He's going to talk about the testing and interpretation of some more exotic measurements you might want to do.

David Blake: Would you test this room? I've seen it done. Would you test it for airborne mold? I mean, what question would you be answering? Other than, I wouldn't. I've seen it done.

So you want to be careful when you test, because airborne mold sampling needs the opinion of the American Congress of Governmental Industrial Hygienists, ACGIH.

It is very unlikely that airborne mold samples will provide evidence that cannot be more easily and reliably obtained by a thorough inspection, very unlikely. So that's our working mantra, because if you find it in the air, you still have to go find the source.

So we skip the testing part and just go look for potential sources. We usually only test for airborne resettled particle identification, and we do that very reluctantly, only when we are really kind of grasping straws to figure out or ruling things out of a touchy situation. We almost never type test for the OCs, and schools do the wrong way. I've discussed this on radon.

Richard Prill: So Dave, what are the OCs?

David Blake: Mold to organic compounds or chemicals, it's very expensive to test for those things, and usually, the test users know this. Obviously some stinky glue can be obvious enough to not necessarily need those sensitive instruments.

When we do test, we tend to use these four traps for sampling. In addition to mold that picks up whatever other particles may be airborne in the room, and we are asked the question, do you need it to be solved to make a decision? If not, then don't do the test. Save the money and spend the money on the fix.

So as a last resort, when we finally do sample, these are typical reasons why we might need to identify an individual pollutant. If warriors want to know, if doctors want to know, then maybe you want to get some sampling, and you may well need professional help.

We sample outside for reference to find out what's airborne from the airborne particles outside, and we set up an instrument, so here we have pump that's sucking a known quantity of air through the cassette, and whatever's in the air is impacted on to a sticky little plate in there, just taking up and looked at under a microscope.

So we set up with a breathing zone, but it's only giving us a snapshot of what is in the room. It may change. It may be different in an hour or in five minutes, but we're getting a snapshot of what's going on in there. So it's not at all perfect but it may help out.

There are no magic numbers. We can't say that 500 scores per cubic meter indicate that there's an issue. But what about 499? So there's no magic number of scores that's good or bad. It always depends. It depends on the occupants, depends on the situation, depends on a lot of stuff. But, there are no standards we can hang our hat on.

But there is some limited interpretation we can do. We do want to see a similar mix of molds in our air sampling in comparing it inside to outside. We don't want to see molds inside that are not outside. It may point to an indoor source of that mold.

Another use of this is just to be able to sample the air directly coming down from the ceiling plan, for example. "What's coming out of a ceiling fan?"

It needs to record results that typically look like that, showing all the things that the particles that can be sampled for: Room 1 data, Room 1 data, compared to outside, right? And typically, this is what we're going to find.

There's a whole lot more dander or skin scales inside than outside; that's very typical, and you don't want to let these numbers scare you in most classrooms.

But looking at the fungal particulates here all added up, we see in Room 1: 233, 173; in Room 2, I can't see the number there. But I know that's much bigger outside, and that's what you want. It's more outside than inside.

~~So,~~ So if you see this, it's inside but not outside, that's potentially a source. Same here, inside but not outside, it digs the question, and takes more inspection to see that that is in fact a problem.

And this is what it looks like, just for curiosity's sake, under the microscope. That's human skin; paper fibers; manufactured fibers like nylon; mold spores;

there's a tacky vitreous right there; black mold; crystalline particles with the whole world smashed to smithereens and flowing in tiny chunks in the air; eraser rubbings.

You're going to see more of these in the school area the closer you get to major traffic zones. Starch, usually from cosmetics, but a lot starch in the air. It's usually an indicator of a problematic indoor environment.

We also sampled settled dust, because it's going to reveal more about the air than an airborne snapshot with that cassette sample. If it's in the air, it's going to be in the dust. Sampling settled dust is very expensive, however. It's about $400 for a set of three tapelets like this. Just press a scotch tape down onto existing dust and put in a clean Ziplock baggy and send off for an analysis.

The good analyst can put that under a microscope and identify the different particles and the relative numbers of particles, and see if that characterizes an issue, a problem, depending on what shows up in that settled dust. Typically, you get new dust and old dust, and some in-between dust, to make that comparison.

So this is just for fun, let's see what it all looks like under the microscope. But the guy you see here in our class is very, very good and can identify just anything under the microscope. He's been a big help in a lot of issues.

In a distinguished vent of fiberglass for example, whether it came from ventilation system or it came from ceiling tiles; remodeling debris; paint chips; all these can point to issues.

OK. So testing is done and you want to resolve your issues and bring it to a close and you've got all your results. It's a matter of sitting down and having an open meeting with the whole staff, letting everybody know everything that went on. Are there any remaining questions?

And the next month, you want to tape the issue and its investigation as resolution as an opportunity to reinforce the program that you have in place. Go back and say, "OK, let's take a look again what it is that we're all about here, and what we're trying to control with our policies and actions, and

maybe we need to do some more walkthrough monitoring to ensure that we're adopting things like fragrant-free zones, which are very popular in schools these days."

So we're expecting the sensitivity of others that as a policy, we're ditching the old carpets, wall carpets too, if they're old and bad, and toys that are not appropriate go home.

And we're paying close attention to ventilation and moisture control. Their cleaning is efficient and effective via policy over getting our basic maintenance, controlling the pollutants that you're aware of. You can see that now this laminator is being exhausted to the outside, improving entrapment in our exhaust of typical things that come up on our list of needed improvements. You can see the clay dust suspended in the air here in the sunbeam.

Some chemicals found that are inappropriate to be in school; dispose of chemicals that are dangerous to create excessive uses or you don't know what they are; and communicate.

Bring a four-stock. In this example, the schools posted in the stock room, step-by-step, every improvement made on the indoor air quality program since it was initiated.

So communicate within the school. Newsletters are a great way to do that. Our newsletters are online and date back several years, and you're welcome to take those and pull out articles, which basically contain everything we can think of to share with you, and make them your own or adapt them for your uses.

Publicize your indoor air quality effort outside the school, too. If you did a walkthrough and you have a program, let people know about it up-front. That way, if there's an issue down the road and it gets them to the press, at least the press will need to lead off with the story that, you know, you have a program. You're not asleep in the room. You've been paying attention, and this issue just came up, and you know how to deal with it.

Let people know what's going on. You are handing out these associate certificates to school, not saying that it's a perfect school, but that they're paying attention and trying to do what's best for indoor air quality for staffs and students.

I clicked, and then I've lost control. Thank you very much. I'm going to turn it back for people in D.C.

Jennifer Lemon: OK, great guys. Thank you so much for all that information. We have the control back.

So we're going to take the temperature of the audience real quick, and see, after hearing this presentation, are you more confident and prepared to use your results and interpret them based on your IAQ assessment?

I hope there is a whopping good percentage towards the "yes." Yes sounds good. This is really great news. So it sounds like you, just like me, learned so much from this presentation and have really gained a lot of knowledge about looking at results, interpreting results, and sharing the results.

And I think Dave and Rich gave us a really great scoop to notch option, as far as what you can do with just a piece of tape and a Ziplock bag versus a large monitor that probably costs a little bit more than the first one. So I really appreciate you guys taking the time to put this presentation together.

So we're going to go through a couple of resources that we have to offer, and then we will launch into the question-and-answer section. So if you do have questions, please use your chat function and we will get to as many questions as we can before the time concludes because we do respect everybody's time. But also know that, if we don't get your question, we are going to have a summary question-and-answer document that will be included in the archived presentation that we'll place online.

So really quickly, Indoor Air Quality Tools for Schools preparation has a lot of great resources. The Web site is our first and foremost. There is an interactive kit and also an interactive problem solving wheel that we have.

So basically, the guts of the kit that are used to in the box are all located online. You're able to download and tailor checklist that Dave and Rich often talked about during the presentation , and you can use those to pass out and, you know, determine how you want to use them to a teacher or a facility and we have them both available in PDF and Word document file.

Other great resources we have are a couple of ways that you can connect with us and know on what's going on as far as IAQ management in schools. First of all, we'll be archiving not just this presentation but other presentations that we've done in the past regarding radon, integrated pest management, and also just other aspects of the indoor air quality framework.

We have an e-mail discussion list, which was referred to as a list serve and there are around 400 members participating in that, and you can post questions. You can answer questions. You can also use it in an anonymous fashion.

If you have a question that could be partially or interpreted in a wrong way, there are ways to get answers. There are sometimes people that don't want to say the dirty word "mold." But it's also a great resource or to ask your peers what's going on in their districts as well.

As Dave and Rich mentioned, they have a great website where you can request a DVD of a very similar to the presentation you just saw, and again, all of this is free. But they also have some great resources to download on these sites.

And again, I hope you're not feverishly writing all of these down. We will be sending a follow-up e-mail that will include all of this information, and you can access these websites after this presentation.

So here are just a couple of reminders. We do have a training coming up on February 23rd that you can register for. That link is located on the homepage of our website at www.epa.gov/iaq/goals. So that's another place to register.

If you're familiar with the organization, the Council of Education Facility Planners International, it is involved in this one-day training, and if you are in

the after storage area at this time, this would be a great place for you to learn a lot and also to network. It is a free training available.

So let's go ahead and move forward with the questions. Like I said, if you have a question, please go ahead and put it into the chat function, and we will try to get to as many as possible before concluding for the day. So let me see.

OK. David, this question is for you. Somebody is requesting more information on the concrete monitoring device.

David Blake: That's a calcium chloride test, and it's basically, a little block of calcium chloride that you tape over the concrete and you weigh it before and after, so you tape it down for 24 hours and then weigh it on a scale.

That will tell you how much moisture is coming out of the slab in pounds per square foot One vendor would be Vaprecision. They're very inexpensive. You can actually weigh it yourselves with a scale you get at the school.

Richard Prill: You can go to almost any carpet installer, and they're going to be set up to do that, because they need to do it for themselves. So a few phone calls and you should find the Calcium Chloride Test Kit.

David Blake: They won't warrant their product if you put it over a concrete slab that's got moisture. So they want to know what that moisture content is also.

Jennifer Lemon: OK. Great. Thanks guys. Another question is: What if the airflow at the top of the door and out of the bottom of the door of the room is in neutral, what does that indicate?

Richard Prill: It is what it is. If you want to make sure air is going out of that room, you might need to have more robust pressure.

Jennifer Lemon: OK. Then, this is not actually problematic, but not technical. A person writes in, if you have one or two people in school having health issues that they are blaming on the school, at what point are you satisfied that there is not any issues that you have done all the sampling that was mentioned in the presentation?

Any thoughts on ways to give this information into the schools without them thinking that you are ignoring the issue?

David Blake: Well, that really depends on the situation, and exactly what's going on. What do you think, Rich?

Richard Prill: Well, I think that points out the fact that we need to do really good prevention to avoid exposures that are going to create a problem in the first place. So we don't want to do breakdown maintenance with people. We want to make sure we maintain the buildings and operate them as best we can.

Because what happens is that if you end up with a complex problem, it's virtually impossible to prove that this space is hazardous or that it's not. There's just too many pollutants and too many sensitivities.

So, you know, the best advice is to do the best you can and get medical people involved and you use really good common sense, and don't measure things you can't interpret because that's just going to confuse the issues.

So that's the way, I'm not going to answer that question because it's really hard to prove things one way or the other when you get into a shouting match, so to speak.

David Blake: But you can exercise your basic skills in there and find out where the air is coming from that's coming into that room with the heat on, with the heat off, that sort of thing, and just everything that we described and go through all the steps. And if you come up empty, sometimes you just come up empty.

Often times, we find the problem comes down to basic cleaning.

Richard Prill: We've gone as far as loaning equipment or having the school actually test a teacher's house and things like that, just to rule things in and rule it out. So it gets very complex and very expensive that things get out of control, too many unknowns.

Jennifer Lemon: Well, great. Thanks for doing your best on that one, guys.

Another question is whether you could generate a list of meters that you discussed in this presentation and the approximate cost? I think we've been asked this before. Is that something that we can provide and follow up on the archive?

Richard Prill: I think a good walkthrough kit is about $1,000 to $2,000. I don't know off the top of my head how many students we have in an average or typical school in the United States. But I'm guessing that's only pennies per student per year to have some monitoring equipment.

So I think it belittles the schools to think about having good monitoring tools, because what gets measured gets fixed. It gets controlled and it gets managed.

David Blake: But don't believe Rich; he's not trying to say that that kit he showed you, carefully labeled, that's not $2,000, that's probably closer to $15,000 to $20,000 for that complete kit.

But you can get a basic kit to just add to your senses, to do really a pretty decent walkthrough and an investigation without the fancy stuff necessarily.

Richard Prill: And the expensive things might cater the infrared thermal imager and the particle counter. The rest of it, I think you can get for around $2,000.

Jennifer Lemon: Do you perhaps have a range? This specific question goes on to ask about CO2 meters. Would you have any approximate range for the lowest versus the highest quality?

David Blake: A really good quality meter , satisfactory for schools, is about $550. That's about the least amount you want to pay for one, and you can spend upwards for $4,000 or $5,000 for one that has data logging and other functions.

Richard Prill: But you can get a really nice data logging for function meter for a little over $2,000.

Jennifer Lemon: Great. Thanks, guys.

David Blake: They make meters that are $8,000 that have pressure gauges built in and all kinds of function. So take a look at what your needs are, your budget, and what you really need to measure.

And, I think it's worth having this equipment even if you're in a district that's kind of strapped for money. You're going to spend a lot more money testing and trying to solve a problem rather than preventing it.

Jennifer Lemon: This question is asking what is the best and cheapest approach to evaluating IAQ for at least 50 schools without having to use lots of money to purchase instruments. Do you guys have any suggestions?

David Blake: By trying to get the science teachers to get a little class project to go around and do some really quick baselines. We found that is successful and brings some real world experience to the science classes.

Richard Prill: That's a darn good idea.

Jennifer Lemon: The same person actually has a commitment to do a presentation to a school board, and they're asking what you guys feel would be the best approach knowing that they only have 15 minutes to effectively communicate this message and the importance of indoor air quality. Do you have any presumptions?

I can say that, first of all, before you start, that the EPA does have some general slides and we can also put you in touch with your regional representative that could give you some further assistance with that.

Richard Prill: If the person has not yet seen the first virtual walkthrough DVD, you should watch that carefully, because I kind of designed that DVD to be an educational tool to acquaint administrators that maybe reluctant with the whole process of looking at a school. That it's not threatening, that it's not regulatory, that it's a good thing to do that will make good things happen, not bad things happen.

So anyway, if you watch that and put your mind in the right place and then you're just trying to summarize the information and cram it into 15 minutes, and take multiple copies of that disk and pass it out. I'll be happy to provide it.

David Blake: You don't want to burn any bridges, you don't want to overreact or make it sound too complex. It's just a way to operate buildings for the people to exercise prudent avoidance to avoid problems.

Jennifer Lemon: OK. I think this is going to be the last question. This is a technical question. When indoor and outdoor have both of similar accounts for mold, is there a general number of raw account force and the air sample that should be cause for concern, especially with molds that can be toxic?

David Blake: No. Again, just always depends. It depends.

Jennifer Lemon: OK. That was pretty simple.

David Blake: Yes. Yes.

Jennifer Lemon: OK. Well, I think that rounds it up. We have concluded this Webinar of the Virtual School Walkthrough 2.0. As we said, we have recorded this Webinar, and we will provide the slides on our archive area on our website where you'll have access to the full question-and-answer documents, the slides, and the audio portion of this Webinar.

So we appreciate your time. Thank you so much for joining us and have a wonderful rest of the day. Take care, everyone.

Richard Prill: Thanks everybody. Bye bye.

David Blake: Thank you. Good luck.