

Iain Walker, Lawrence Berkeley National Laboratory – Indoor air quality challenges and new opportunities in research (10:59 min; 10,306 KB)

Kat Godlewski: Welcome to the US Environmental Protection Agency’s Indoor airPLUS podcast series. This episode is being recorded at the Energy and Environmental Building Alliance Conference and Expo in Denver, Colorado. The Indoor airPLUS team has the privilege of speaking with Iain Walker today from Lawrence Berkeley National Labs Residential Buildings Group to discuss indoor air quality challenges and new opportunities in research.

Nick Hurst: Hi, we are at the Energy and Environmental Building Alliance Conference and Expo in Denver, Colorado. My name is Nick Hurst with ICF International and we’ll be exhibiting and presenting here on behalf of the EPA’s Indoor airPLUS Program. Today we’re sitting down with Iain Walker from Lawrence Berkeley National Labs Residential Buildings Group to talk about the challenges associated with indoor air quality and the research that Iain and his team are doing. Iain, thanks for being here. Could you give us a bit of background on what the Residential Buildings Group at LBNL does generally?

Iain Walker: Sure, the group has quite a history. It’s had a few different names, but the work it’s been doing is pretty much focused on indoor air quality and energy use in homes. Hence the name “residential,” right? The group, since about the late 1970’s, did some of the very first work on indoor air quality. They developed some of the very first blower doors to be used, which are now used a lot in the industry to measure air leakage. They developed some of the very early ones. They helped write the very first versions of the ASHRAE 62.2 indoor air quality standard, back in the 1980’s. And so, the group has a long history of doing stuff related to ventilation and indoor air quality and were still doing all that now. We’ve also done a lot of work on heating and cooling systems particularly related to ducts. We’ve done a lot of work on how leaky your ducts are and developed duct leakage test methods, much like we do for envelope leakage test methods.

Other things we’ve been involved in more recently are looking at stuff like a lot more detailed work on indoor air quality and health impacts. Something we are really working on right now is a lot of ventilation standards historically have not been able to consider health. And we’ve learned a lot more about it working with other groups at LBL to actually implement health issues directly in indoor air quality standards, not just odor and moisture and perception, and so on—to actually get down to, “you will be in a healthier home if you do that.” That’s what a lot of our more recent work has been focused on.

And over the years we’ve also done work on things like retrofitting homes for energy efficiency. We’ve worked with the Passive House people and looked at deep energy retrofit solutions. So a whole bunch of stuff related to energy and indoor air quality in homes has sort of been what our group is all about and still is.

Nick Hurst: Sure, excellent. I know you are presenting here at the EEBA Conference this week. Can you give us a couple highlights on what you will be speaking about?

Iain Walker: Sure, I work for the DOE Building America Program primarily, and one of the things that we are talking about here at the conference is, sort of, what is the state of the art in indoor air quality in homes, and what are the new things we need to do? This is going to help guide DOE in their research planning. The idea is that we are looking both 2 and 3 years from now—what are the sort of things we

need to improve in existing codes and standards. What's the research and the technical work to be done to back that up? What are problems and issues that builders face in their day-to-day of doing business? Are there indoor air quality problems that they're scratching their heads about that we can help with? Also, we are looking long term, mostly because we can't do everything at once. We are looking 5, 6 years from now, maybe we will have very different ways of thinking about how we classify indoor air quality in homes.

Nick Hurst: Sure, great. Well, what would you say some areas of indoor air quality that are particularly difficult to research? You guys obviously have experience in that, but which ones are difficult to research and quantify, or aspects of IAQ that are maybe sometimes overlooked in the industry?

Iain Walker: Just speaking broadly, when we talk about health, for example, a lot of health based standards--I'm not talking about indoor air quality necessarily, but sort of more broadly--they are often based on very large-scale epidemiological studies. Thousands and thousands of people are involved, so you can have a control group and a group that has something changed about that you can look to see what happens. Then societally we can decide we need to regulate this chemical or whatever you want to do. Similarly for OSHA that protects workers, they are looking at large populations, large sample sizes.

It's incredibly difficult for us to do that in people's homes, for a whole variety of reasons. Often there are issues of access. It's simply hard to get people to volunteer to have things done in their homes. Even when we are going in there saying, "Well we're going to do a better job at say, filtering the air in your home." So in theory the air in your home will be better, right? Less particles in the air. It's quite difficult to get people to volunteer to have crazy scientists come and measure things in their home. And that's just sort of a very practical thing.

We're still looking at things like how do you actually measure pollutants. Some pollutants are easy to measure, some are not easy to measure. Some you can do short term, some require a long term. It's not a simple technical task to assess the indoor air quality in homes currently. There is a lot of work being done in both the public and private sector though on improving sensors. Like, how do you sense various chemicals in the air? We're not involved in that explicitly, but we're certainly working with the companies that are doing that, because as a researcher, I'd love to be able to hold in my hand something where I clicked a button, and ten seconds later it tells me what the indoor air quality is. That just doesn't exist and probably won't for a long time, but I think we're getting better. For now, some things are just not that easy to measure and assess.

Nick Hurst: Sure, yes, that's very understandable. As you know, Indoor airPLUS is to a large part a prescriptive checklist of best practices building on the ENERGY STAR foundation of energy efficiency and of course adding building durability measures, pest prevention, and control of radon in the home. And of course the materials we are bringing in, focusing on those, as well—but it's not a menu of options to choose from. It really is a prescriptive checklist, kind-of "all-or-nothing." How do you see the building market changing as more IAQ research is being done and performed, and what role do you see for Indoor airPLUS in that market?

Iain Walker: Right, I think the biggest change we're going to see is probably people get more options. Rather than just being a checklist where you yes, did something, or no, didn't, were going to have options to say, well.... I'll give you an example from the world of ventilation, and something we're working on in the ASHRAE standard right now. Let's say you put a much much better air filter in your

home. Can you maybe trade that off against not having to ventilate so much air and you can maybe save a little energy in the home? Because now you have a system that isn't just moving air, it's filtering it very well. In the past, we couldn't really do that because we needed a much better understanding of the health impacts of the various chemicals and so on. And as we've learned more about that, we can learn about the sort of tradeoffs and then you can have something that isn't just a simple checklist. Maybe there are three paths to "nirvana" instead of just one where you can take this approach, or this approach, or this approach. So yes, it's more complex, but I think giving people options and adding that flexibility probably broadens the market appeal. It gives people different ways to comply with the voluntary standard you are putting together. I think that can only be a good thing, but as I say, we're sort of in the midst of doing the research work right now that is going to let us, for example, make those tradeoffs or come up with different checklists.

I also think that there are some fundamental changes happening. For example, in theory—we do this already in California and a few other places do it to—in theory we're going to have federal regulations on things like formaldehyde in building products. Right there, that could become one thing that you don't have to worry about any more. If you can't put in high formaldehyde building products, then you don't have to worry about that, and you can move down to the next thing down your checklist of what are the pollutants of concern and go to the next thing you can worry about. There is going to be, I think, a lot of progress coming on.

Also, there's the chance to maybe become more performance based rather than just a checklist. Maybe you can do things like make sure that people verify all the air flows and the filtration system and that lets you do something else. You get into diagnostics in a home, actually evaluating the systems that are there. I touched on this earlier—maybe we're going to have some better sensors. We won't be able to sense all pollutants, but we might get to the point where a relatively affordable and easy to use handheld device could tell you something about one of two of the major pollutants in a home, and then you could actually test the air in a home.

Now, you get into the debate about, if this is a checklist you're filling in one day, on the day that you test is that okay? You've probably heard this argument before from radon testing, which has been with us a long time. There's always the question about, "Well you've tested today or maybe it's over a few days with your radon sampler, but six months from now, is that still okay—or a year from now, or ten years from now when the building has aged somewhat?" And the current answer is unclear. I think we're going to have more—or the ability, I should say—to test for different pollutants in the air is getting better. And I think there's going to be more of that sort of performance based stuff coming along in the future.

Nick Hurst: Yeah, very exciting! Well, there's a lot of exciting stuff happening here at the EEBA conference obviously. Indoor airPLUS is releasing Revision 3 of the Construction Specifications. There's lots of great research and knowledge sharing from folks like yourself and, of course, practitioners in the field—the Home Energy Raters and builders who are implementing this work and participating in programs like Indoor airPLUS, the Zero Energy Ready Home Program. Some of them are on stage very soon this evening, winning awards for the Home Innovation Awards through DOE's program. Thank you so much for taking some time out of your schedule here to meet with us and talk about LBNL and indoor air quality.

For those of you listening, be sure to check out LBNL's research at indoor.lbl.gov. Also, be sure to check out Indoor airPLUS on Facebook, and follow us on Twitter at E-P-A-i-a-PLUS (@EPAiaPLUS). Thanks again for listening.