

## Health@Home Web Series – Webinar 2: Freedom from Contaminants and Pests

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### Lael Holton:

Good afternoon and welcome, everyone. This is session two of the Health@Home Rehabilitation Guidelines. Today we're talking about freedom from contaminants and pests. If you're here for a lesson on how to make sourdough bread, then we are in the wrong location, and I'd say I'd have to refer you to YouTube. But we'd like to welcome you all, and we're going to get things moving along today.

Before we get started with that, my name is Lael Holton, and I work with AECOM. We provide technical support to HUD through the Community Compass Technical Assistance Program. We're very happy to have you all here today. I've got a few procedural things that we need to discuss and go over right at the top here before we jump in. First, everyone should've been muted upon entering. We'd like that to continue throughout the full course of the webinar.

If you have technical questions or issues, please put those in the chat box that would be on the right-hand side. If you don't see the chat module on the right hand side of the window, at the very top right there are a series of blue icons. There should be blue icons. One would be chat. You click on that, it will open the module for you and you can put your information in there. When you send the chat, please direct the chat directly to the host, the presenter, and the panelists. That way, all of us get to see that and we can take care of the issue that you have that way.

If you have questions for the presenters, there is also a Q&A module that you can find there at the top right. If you click on that and make it blue, it will open up another window on the right for you. And for that, you can put all of your questions related to the material and any information that you need in that box there. We will work our way through the course of this webinar, we'll be cataloging those questions, and we'll push them forward. And we should have some Q&A time at the end. So, we'll be making reference to the questions and the answers in the boxes there, and we'll be answering some of those questions.

I think that takes care of the majority of the basic housekeeping. I do want to remind everyone this session is being recorded. Just so for future viewing, and for folks that had registered and weren't able to attend today so they can get credit. Both the recording and the slide presentation itself will be available on the HUD Exchange, probably about a week and a half to two weeks from now once it's gone through 508 and it's ready and available and ready to go.

So, with that, I think we are ready to look at the quick agenda today. Obviously, my part here is almost done. Then, we'll be going to Michael Freedberg from HUD, who will be giving us a little bit of an overview about the Health@Home context. We'll speak with Ellen Tohn about contaminant free. And then we will also hear from Teri Provost from SEDA-COG, relative to a deeper dive into radon testing and remediation. Susannah Reese from StopPests is going to give us information on integrated pest management and pest rehab strategies.

We do want to take some time and reserve some time for questions. So, hopefully, we will have an opportunity for that as we go along and get to the end of today. I think at this point in time you can see these are our four presenters and panelists that we will have here. As I say, Michael will lead us off. And so, Michael, it's over to you. I think you are still on mute, Mike.

**Michael Freedberg:**

Good. Okay. Well, welcome everybody to today's webcast. Those of you who are joining us for the first time, and those of you who were with us for the first session last month, healthy housing has never been more important than it is today. And as we build tighter, more energy efficient homes, and with the advent of the coronavirus, this issue is foremost in everybody's minds, especially those of us who work in the affordable housing sector. We'll need to pay more attention than ever to healthy housing and the indoor environment.

So, last month in our first session we focused on ventilation. It's archived online if you weren't here for that session. Today's session, you'll focus on contaminants and pests. And then, we will do a couple more sessions in September and October. We invite you to sign up for all the sessions if you haven't done so before.

In our first session, we covered the indoor environment and health connections. I want to do the same today, that there are increasing numbers that show the significant health benefits that result from including the home environment for fewer asthma symptoms, fewer deaths from radon, fewer falls from safety, especially for our seniors.

The curriculum for today's discussion and for the entire series are these Health@Home Guidelines, which you can find on HUD Exchange. I'd invite you to pull up that connection during this webcast. You can Google Health@Home at HUD Exchange, and I think you'll be able to access it directly. The guidelines are organized around nine healthy housing principles. The eight widely used healthy housing principles that have been adopted by HUD and other agencies, plus one more that we've added, healthy living and active design. So, nine in all.

What's interesting and new about the guidelines, I'm assuming that many of you are familiar with the healthy housing principles. What's new here is that we've provided a crosswalk between the principles and the rehab standards that your agencies typically adopt for your rehab program, which are organized by building components, foundation, plumbing, heating and cooling, et cetera. So, hopefully you can easily incorporate these in your current rehab standards or program requirements. At least, that's the goal here.

Here's an example of one principle, which is in Section A of the guide. It discusses the rationale, in this case, for ventilation. Principle Four, keep it well ventilated, including ASHRAE 62.2 as discussed in the back, which is, of course, the gold standard for ventilation purposes.

Here's an example of what you will find in the standard section. This is a simple example of appliances. You can see that there's both a repair standard and a replacement standard, which is the case for every one of the standards.

And just a couple of words about the context. The focus here is really on moderate rehab, home remodeling, or home repair programs. Primarily for single-family and low-rise multifamily. We assume that those of you who are doing substantial rehab often use a Green Building Standard. Some of them are listed here, which, of course, all have very robust healthy housing criteria. So here, we're taking on steps that you can take when you're doing less than substantial rehab, or even operating a home repair program.

So, just a couple of words about COVID-19. We will be doing a deeper dive on this front in the next session, September 10th. We encourage you to join us for that session. In the meantime, we've pulled

together some resources that you can reference. This is ASHRAE's multifamily guidance. They got a terrific set of recommended actions, divided, as you can see here, into immediate actions, longer term upgrades, and resident education. These are just some examples.

They also have a similar single-family guidance document. These are a little less robust, frankly. They focus more on O&M, operation and maintenance issues, less on rehab or building upgrades. But there are a variety of resources that are out there, which we'll be covering in more detail in the next session. ASHRAE, AIA, the CDC, of course, has a lot on this subject and we've posted quite a bit of this on our HUD Exchange site, Better Buildings Challenge. Here are some single-family resources that you may want to consider, as well.

So, with that as background, we're going to focus now on two of the principles, keep it contaminant free, and keep it pest free. I'm going to introduce Ellen Tohn from Tohn Environmental Associates to lead us off on that discussion. There's really no one in the country who knows more about this, and has been more committed to this issue than Ellen. We're delighted to have her take this on.

I also wanted to thank AECOM, as well as the folks from Livable Housing, Armand Magnelli and Jayne Windham, who along with Ellen were the real technical resources for preparing these guidelines. So, I think with that I'm going to ask Ellen to begin the discussion on the contaminant side. Over to you, Ellen.

**Ellen Tohn:**

Thanks. Thanks very much, Michael, for that super kind introduction. I'll have to let my kids know that you think I'm an expert in something at least. So today, as Michael said, we're going to talk about two principles, contaminants and pests. Let me start off with contaminants.

The Health@Home Guidelines provide guidelines in six categories on six topics. I'm going to give you a quick spin through four of them, radon, lead, asbestos, and VOCs. I won't be covering environmental tobacco smoke, it's really around smoke-free housing policies, and sewer lines, because the guidelines are quite straightforward for sewer lines and many of you are familiar with them.

First, I want to tackle lead. I would imagine most of you received HOME or CDBG funds from HUD are familiar with the HUD Lead Safe Housing rule, which has been around for a while. But just because it is so important, we really wanted to re-emphasize what is required here. As we know, lead is still a significant hazard. Over 24 million homes in the United States have significant lead hazards that produce enough lead in the home to result in an elevated blood level. And over 40,000 children have blood levels above the Centers for Disease Control's threshold that requires follow-up.

So, what do we want to do proactively to avoid having children have elevated blood levels? If you were receiving HUD funding in pre '78 properties and disturbing more than two square feet of lead-based paint on the inside and eight square feet on the outside, you need to follow these requirements that I'll go through briefly below.

Properties that are designated for the elderly or persons with disabilities, unless there's a child under six, are excluded from these requirements. The requirements there depend upon the amount of money that is being spent in the rehab. More money that's spent, the more stringent the requirements. And the requirements really kind of have three buckets. One is how do you assess what to do. For projects that are spending more than \$25,000, you have to use a lead certified risk assessor to do a risk

assessment. If you're spending 5 to 25K, you can opt out and do a standard set of treatments. In either case, you're going to control lead hazards.

Again, if more than \$25,000 is being spent in the rehab, you want to do permanent abatement, and there's specifications about what that means. And if you're spending less money, HUD is requiring stabilizing the paint through a series of practices called interim control. Not permanent solutions, but things that will prevent lead hazards in that timeframe. In all cases, using lead-safe work practices and doing clearance testing to make sure that we left the job site clean. And EPA's just updated those clearance standards to lower levels based on more recent research.

As Michael pointed out, the guidelines that will be discussed and we're discussing have two forms of presentation. One is based on the principle, we're not talking about contaminants, but we do this crosswalk so that you can easily grab some of these elements and put them in your rehab standards, which are organized for most of you by a repair and replacement standard. You'll see on each of these slides, in the blue highlighted text, the crosswalk that we provide. And that same crosswalk is provided in the guidelines themselves.

One other piece of lead that is maybe a little less familiar to some folks would be lead service lines. Most of us are quite aware of the lead hazards that can result from corrosive water moving through lead service lines, like the very difficult exposures that were documented in Flint, Michigan, Washington, DC, and many other cities. Lead in plumbing was banned in 1986. Lead in paint was banned nationally in 1978 and plumbing was banned in '86. So for service lines that were installed before 1986, they could have lead in the plumbing materials or the service line.

We're suggesting a new guideline that if you are replacing water heaters, that you determine if the service line exists and you can consider replacement. We suggest as one national resource, the link there to the Lead Service Line Replacement Collaborative. You can click on that and learn more about lead service line replacement and approaches, and often, find a link to your local public water supplier which should be able to identify whether that blue line you see moving from the home to the main service line, that section, if that has lead in it. Your public water supplier can also tell you that, and indicate whether there is funding available or support for that kind of replacement. That really varies locally. So, a new thing to keep in mind when you're doing this type of rehab.

Next, I want to turn to formaldehyde and volatile organic compounds. So, VOCs are sort of a class of chemicals that, as we breathe them, can, for some people, cause headaches, nausea, eye, nose, throat irritation. So, they are of concern. And formaldehyde also is a contaminant of concern.

In every rehab job we're all making choices about the type of products and materials we want to use in that job. And those choices with federal rehab funds, we'd like to make those choices result in the healthiest products we can, recognizing that there are costs involved in every job. We think now that there are really cost-effective choices that you can be making in all of these categories.

Composite wood is an example where there's been great evolution. There was an update to TSCA, the Toxic Substances Control Act, by Congress somewhat recently that required updating around composite wood, hardwood plywood, medium-density fiberboard, particle board, other finished goods, that are now requiring those materials to be compliant with TSCA Title VI. So, look for that labeling compliant with TSCA Title VI. And most composite wood is now in the process of meeting that new TSCA standard. So, you just want to be looking for that label.

For paints and adhesives, we're suggesting, this is consistent with guidelines from EPA as well, that paints and adhesives meet the California South Coast Air Quality Management District Rule 1168, which I am not going to list all the various elements of. I will in two slides tell you how you find products that meet that South Coast Air Quality Management threshold, because there are programs that are certifying their products as being compliant with that set of thresholds. So, there are lots of paints and adhesives that meet this standard.

Similarly, when you're making flooring choices, whether it be carpet or hard flooring, these, again, are choices around products. For carpet, the Carpet and Rug Institute has come out with, many years ago, a Green Label program or Green Label more recently, well it's not so recent, but their successor, the Green Label Plus program even more stringent. That program minimizes VOCs. There's an easy, navigable website where you can search by product name. You can see what's compliant, and find products that will meet Green Label Plus. I will encourage you if you are putting in carpet, to absolutely meet Green Label Plus. There are plenty of products that are very cost competitive that meet that standard.

And it goes without saying that because we're thinking about healthy housing, we would discourage people from installing carpet in wet areas, be that bathrooms, laundry rooms, dining rooms, kitchens, because that moisture in the carpet can result in exposure to allergens, mold problems growing in the wet carpet.

For resilient flooring, hard flooring, be that wood, Marmoleum, linoleum, ceramic, we again want to minimize VOCs. And here, we're suggesting that product meet the FloorScore standard by the Resilient Flooring Institute. And again, it's an easy, navigable website where you can find products that meet those standards. Again, you'll see that here in the blue, our crosswalk to the rehab standards.

In the guidelines that Michael showed you the cover sheet to, I'm now skipping to an appendix. This is a handout we created for residents, but I also think it's a really nice cheat sheet that you might use with your contractor, or if you're a program administrator, or a PJ, to share how you find products meeting these various standards. So for paints and adhesives, here's where residents can focus more on paints. You can see that you can look at the Master Painter Institute, Green Wise Gold, or Green Seal, all of these have products that meet that South Coast Air Quality Management District threshold. And carpet and hard floors, again, we send you to the Green Label Plus program or the FloorScore program.

Turning to asbestos, which should be familiar to most of you, this is something we worry about in terms of increasing risk of developing lung cancer. Like you'll hear with radon, this is made worse if there are smokers having that exposure. You find asbestos in a variety of materials in a building or home that are listed here. I won't read them. You guys can all see it. The guidance here is consistent with longstanding EPA policy, which if it's damaged, isolate the area. If you are going to disturb it as part of, say, a heating system replacement or a roofing job, you really want to contact an asbestos professional to make sure we're not having exposures to workers or residents.

The other area that wasn't listed that we definitely want to draw attention to is vermiculite in attics. You'll see that this is what this picture is of, so that material, that insulation you can find in attics. Some of that was mined from a particular quarry that had asbestos in it. You should not disturb it. Or if you are as part of an energy job, an air sealing, insulating, do that in concert with an asbestos professional.

And finally, I want to turn to radon, and we'll hear a lot of really practical, real world experience from Teri next. I wanted to lay out really the framework. This draws upon EPA guidance for rehab and radon. This will be new to many of you, although not new to Teri because Pennsylvania's been doing a similar program for some years.

Radon we worry about, because it is linked to a significant number of deaths associated with lung cancer each year. The risks are, again, much higher if there are smokers in the home. And so, these HUD guidelines recommend a couple of approaches. First is testing, to do a short-term radon test in areas that are more likely to have radon risk. So, there are EPA Zones 1 and 2, that I'll show you a map in a second. The map is in the guidelines and on the EPA website.

Or, if you're doing a rehab that could change the air pressure in the home, for example, replacing an HVAC system, or adding insulation doing energy work, this can change air pressures and may change exposures. Our goal here is really twofold. If there's a radon risk before you start, try and take care of it during the mitigation. But the second is, avoid increasing radon risk as part of the rehab.

So, you'll see that leads to two recommendations here. One is to test for radon before you begin your work. And if the levels exceed four picocuries per liter, which is EPA's action level, then undertake radon mitigation. And Teri will walk us through a couple of case studies. Average cost of that mitigation may be around \$1,500. You can also confirm the short-term results with a longer 90 day test. And in several studies that I've participated in, we've done that and we've found quite a few of the short-term tests when we did the longer 90 term test ended up not being above four. And this is a long-term exposure risk, so the 90 day is more representative of people's actual exposure.

The second would be to test not just pre-work, but we really want to avoid rehab increasing risk. So if the levels were higher than pre-work level, and greater than four and higher than pre-work, so if you tested at the beginning and it was two, and you test out at the end and it was eight, something we did increased the radon risk and we would like to mitigate that. So, these are the recommendations for testing and mitigation.

This is the EPA Zone map that I was referring to. In all EPA maps red is bad, orange is less bad, yellow is a little bit better. And you can see Zones 1 and 2 are based on soil and geological formations is more likely to have radon risk. It doesn't mean you wouldn't have risk in Zone 3, this is just a greater likelihood. Aside from the testing and mitigation approaches recommended in the guidelines, there are a set of precautionary measures that are outlined. If it's not feasible in your program to test, or if the pre-work levels are low, the guidelines recommend a set of precautionary measures that EPA has also been discussing for some time. This is to minimize the likely increase in radon levels as part of rehab. There are three parts. Ventilation meeting ASHRAE 62.2 standard that Michael has already mentioned. The federal DOE Weatherization Prog, for example, for some years now has required those weatherization and energy jobs to meet ASHRAE 62.2, so that is often done in that program to just installing a continuous bath fan.

And the second two parts are really about minimizing exposure pathways. Radon is coming up through our geological formations, so we'd like to create a barrier between the dirt and where people are living. So, covering dirt in basements and crawlspaces with poly in a quite specific way to try to minimize gas moving, and the same for sealing sump pumps because those holes can become a path for radon to come up.

I've been involved in a series of studies that HUD and DOE have funded that I've done with colleagues at the National Center for Healthy Housing and the University of Illinois Champaign-Urbana, and we've shown in most studies, most recently, that when energy efficiency and weatherization programs pursue these precautionary measures, we avoid increasing radon as part of energy efficiency upgrades on the first floors. In the basements, we sometimes see some slight increases, but we do not see any statistically significant increases on the first floor that are occupied levels. So, we feel that these are good things to do for moisture reasons, for broader contaminants, and for radon.

So, with that, I want to introduce Teri, who is the Director of Housing Rehab and Flood Resiliency, and is the Acting Director of Community Development Program at SEDA-Council of Governments in Pennsylvania. She is administer of HUD and CDBG funds. And I really thought it was great to have someone from Pennsylvania, because they, for some time, have been running a program on just this kind of radon testing and mitigation. You can hear me talk about this in general, but it's great to hear from one of your colleagues that's been active for a while running a program implementing these kinds of approaches.

So, with that, I'm going to hand it off to Teri. And remind folks, if you have questions, please put them in the Q&A. We hope to have time at the end to go through those, and we'll get back to folks in any case. So, hand it to you now, Teri.

**Teri Provost:**

Thank you, Ellen. I will skip through the first few slides and we'll dive right in. Radon, as you may or may not be aware of, is likely in one in every 15 home across our country. So, it is very prevalent in the United States. It can be found in any type of home, whether your home is new, old, well insulated, or drafty. Actually, some very well insulated homes have high radon because there's not enough ventilation. So you need to test for radon. It is the number one lung cancer causing for nonsmokers that we know of. For smokers, it's the number two leading lung cancer cause.

So, radon levels are usually higher in the basement, so you should test the basement if there is an existing basement. If there's not, you should test the lowest habitable space. And it's recommended, as Ellen had mentioned, that we are looking for that four picocurie level. That's the threshold we're looking at. So if it's hitting that number, then we must mitigate.

The Department of Community and Economic Development, the Commonwealth of Pennsylvania has been setting these standards for quite some time. For buildings in EPA Radon Zone 1 and 2, we follow the testing procedures AARST protocols. And for mitigation for radon levels of four picocuries or more, we use ASTM and AARST standards. These are, like we had mentioned, standards we have been complying with for many years, and we continue to do so. So these standards are actually spec'd out before we bid out a housing rehab project for existing owner-occupied housing. We test each and every home.

Our housing rehab specialists are the ones that perform the testing. They are certified. And as you can see, this is an EPA map of Radon Zones in the state of Pennsylvania. Pennsylvania is kind of a hotbed for radon. SEDA-COG, SEDA-Council of Governments is an 11 county region. Every one of our counties is in Zone 1.

For example, I was part of a study, my own home, without federal dollars. And the radon in my home was over 100 picocuries. So, that's pretty awful. We had that mitigated, and with our own mitigation, it

was over \$1,800 spent. Homes in the area that are situated next to my home are also very high. There are two houses we're currently looking in Snyder County, currently doing existing owner-occupied housing rehab that must undergo mitigation. Their testing levels are around 30 picocuries each, and they're almost side-by-side in the county of Snyder.

DCED minimum standards. This is very interesting. When I started to dive into the Health@Home Guidelines, and knowing what Pennsylvania has been doing for quite some time, they actually mirror each other quite well. So when you look at the Health@Home Guidebook, and compare against the DCED minimum standards, the Commonwealth of Pennsylvania is essentially streamlining this for the recipients of HUD dollars. They have mirrored that Health@Home Guidebook, as well. So, the repair standards has a minimum life of five years. So, all housing in this program, the homes, existing occupied housing program will be subject to radon testing.

It requires mitigation must be built into the specifications before the project is actually sent out for bidding. And this is under the DEP regulation. All testing services, including the lab certification and the mitigation activities performed under our program in the Commonwealth, must be conducted by individuals or entities having the appropriate certification by DEP.

So, although our housing rehab specialists deploy the system in the field to see if those homes are above the four-picocurie level, they don't actually perform the work for the mitigation. That is in the subcontractors usually, well the contractor who gets the job, they usually subcontract that out to a certified radon mitigation specialist. We have about three in our area that do the majority of the work. The replacement standard is a minimum life of 20 years. So as a result of the testing, if there's a presence of radon and we remediate that, we need to make sure that that system hasn't been in place for more than 20 years.

A little bit of an environmental review here. So, I wanted to throw in a slide about really why is it so important to have, not only having healthy homes, but where does this all start from? The National Environmental Policy Act actually starts for any federally funded program. With HUD, we understand that the responsibility is now on us as recipients of HUD dollars. I went to an ER training, and the gentleman providing that as a responsible entity had actually said, "We need to make sure that every dollar we put into a project that has federal funds tied to it, is free of any and every radioactive substance where it could affect the health and safety of occupants, backed by science."

So, how do we do that? One of the thresholds with the NEPA review process that each and every one are undertaking for our program, tells us we need to be mindful of radon. We need to be mindful of that contamination. So, in your environmental review is a tiered environmental review. Your tier two should include your testing result and what kind of mitigation you're recommending. And again, here you have the EPA guidelines for that recommended mitigation of anything above the four picocuries per liter. Radon testing housing rehab is done, as I indicated earlier, by our housing rehab specialists, who are actually employees who I supervise. We use a Short-Term Electrets to complete the testing for 48 to 96 hours, and we follow all DEP requirements pertaining to their certifications. The short-term could be used for up to three months. We usually do the shorter, the 48 to 96 hours window.

If those test results hit that threshold of the four picocuries, we prioritize having that mitigation installed immediately to remediate that and get those levels lower through a radon mitigation system as soon as we sign the contract between the homeowner and the housing contractor to perform the work. It is one of our priorities to ensure that we're mitigating that risk of contamination.

After mitigation, it sounds easy, but it takes a little bit of work, but after the mitigation is completed, we retest the property to ensure the levels become lower than that four-picocurie mark. That is also documented in the file before, and they get a warranty with that radon system. And there is a level that you'll see ... I wish I would've taken a picture of that and had it as one of the slides, but it will show you where that radon level is right on the system in the inside of the home.

When mitigation is required, we install the continuously running bathroom vent fan. And when necessary, the range hood. One of the things I had read in the Health@Home, there's a lot of precautionary measures we can take, and I feel as though Pennsylvania is doing that very well. So it's not just about the mitigation system. We heard from Ellen a little bit earlier talking about you need a valley. So if you have an airtight home, you could have really large radon issues. So, you need to ensure you have proper ventilation.

So, you could install whole-dwelling ventilation in accordance with ASHRAE 62.2 standards. You could have exhaust only systems to actually increase your radon. And in some basements, you might have things where you need to actually have places where you can have vapor barriers. So if you have exposed earthen floors, you should have vapor barriers underneath the concrete slab. You could have sealing of your sump pumps. You could install an airtight sump cover. There's a lot of things, because the crevices you have in basements can let that radon infiltrate your basement. And if you have no ventilation because you have an airtight home, you're creating this vacuum inside of your home that's not allowing the radon to escape.

Our department currently charges \$250 per unit each test. And we've got it done by the housing rehab specialists. We use the S-Chamber testing device, which can be used not only for the short-term testing, but also a long-term radon testing. But as I had indicated, we usually do the short-term testing.

There are some misconceptions about radon, as well. Some folks think that they're the older homes, that is has maybe a basement or it has to have a dirt floor. And that's not true. It's most likely to actually accumulate in homes that are very well insulated and tightly sealed.

The average cost for radon mitigation in the housing rehabilitation program that I have seen to date ranges between \$1,500 to \$2,500 depending on the issues. Some of the houses we'll talk about in a minute, this house for example, had a second fan on the opposite side of the house too, to reduce the level. Sometimes it's not as easy, even though you have a specialist coming in doing that radon mitigation system, those levels don't always drop below that four picocurie level. So you need to make sure that you're sealing cracks and things in your basement. That if you still can't get it down, the radon mitigation representatives will sometimes have to install a whole other fan. Which is kind of crazy, and not very cheap.

These are some examples of radon testing that we have seen. So when these projects are bid out, we know that there's a radon problem. We've already tested. We've spec'd out radon mitigation must be included when we performed this work. So, they know up front that this house has elevated radon levels. We have to have a Pennsylvania DEP licensed and certified contractor to install the sub-slab depressurized type system. And it is always vented above the roof line of the dwelling. You don't want it next to openings, windows. As far as you can get away from having it too close to any openings, the better.

And so, you want to basically have the soil, the contamination of radon, the gases coming out to go above your roof line so that it doesn't seep back into your home. The system that we use has a vent pipe. This is installed on the exterior of the home. We are mandated to have a copy of the radon installer's license before payment is made. And the warranty information is given directly to the homeowner before we process any sort of final payment application to them.

Snyder County, I live in Snyder County. We have two existing owner-occupied housing rehab projects going on currently. They're actually side-by-side. I was at the one last week, and it was to do with the radon system to be honest, and this is one we had a hard time getting the radon down below the four picocuries. The radon before, as you can see on the screen, was 41.5, which is very high. We had to install two fans to improve the radon levels.

But unfortunately, the homeowner also has a need for humidifier. So, she had it hooked up where it would drain. She's elderly. She had it hooked up so it could drain directly outside. Well, that creates some exposure, as far as not having everything sealed up. So, we are working through that. We ended up having to do a change order to help her out because she has a medical necessity to have that humidifier. So, it did cause some problems. It is rectified. That humidifier was going to go through, I think it was her wash line now, but it was a problem.

So even though you rectify one issue, sometimes in the homeowner's mind, they've lived there 20 years, 30 years, "So what? I've always had high radon." But if you're using federal money, it is extremely important to make sure that we're dealing with radon appropriately. Here's some photos of that. And this is another radon system we had installed. This was a little bit easier to perform. This was in the city of Lock Haven in Clinton County. This radon system is very similar to the last, although this one, the radon actually wasn't as hard to get that level down below that four picocurie level.

So, this project was very simple. We had that bid out and spec'd. We had the radon mitigation specialist perform the work. It was a pretty simply process, and it did go below that required four picocurie level. And that is the line of the vent pipe that you'll see in the basement to have that gas go up and around and outside, instead of having it trapped in the home.

Oops. Sorry about that. So I will pass it on, and that's what I have for today. We will take questions at the end as mentioned before. But for now, Ellen, back to you.

### **Ellen Tohn:**

Thanks very much, Teri. The other questions, put them in the Q&A. I'm responding in the Q&A as people put their questions in.

So, turning to pests. The reason we worry about this is they can carry disease. But being in a home with mice and cockroach droppings and feces is a known asthma trigger. And with 8% of kids and adults currently reporting asthma in the United States, it's something we really want to get our hands around. One of my favorite pest experts once said to me, and Susannah, who I'll introduce in a second will probably reiterate this, pests are looking for three things. Food, water, and a date. That's another pest.

So, during rehab, what we really want to do is block their entry into the building. We're not going to eliminate species, we just don't want them in our homes. So, Susannah Reese is going to talk quite a bit about blocking pest entry, and also identifying pests and responding to them with an integrated pest management approach. That's our rehab, and we're really going to focus on this pest exclusion.

Post rehab, Susannah will give us some advice on integrated pest management practices and links to do that. But we're just really going to focus on the rehab activity itself. Post rehab, we also try to keep humidity levels below 50% because that will minimize dust mites, which are also a known asthma trigger. So, over to you, Susannah. I know Susannah because we've worked together for maybe a decade. She's at Cornell, and she's a program manager at the Northeast IPM Center doing a lot of work with affordable housing. So, she's a perfect candidate for this talk. So Susannah, can you keep us in that 10-12 minute zone, and that would be fantastic.

### **Susannah Reese:**

Okay. So as Ellen mentioned, I work with affordable housing, mostly public housing. So what I do is, I train and I do consultations, provide technical assistance to HUD supported housing on integrated pest management. What I'm going to talk through today, and follows along with the Health@Home Guide, is mostly talk about exclusion. Keeping the pests out. But, I'm going to show you a lot of pictures of what I see going wrong in buildings and in homes, so you don't repeat these mistakes as you rehab and renovate.

I just want to briefly say that integrated pest management, or IPM, is an approach to pest control that uses multiple tools. So for example, for cockroaches we use sanitation, exclusion, and baits. We're not just relying on chemicals, but we're using multiple tools to fight a pest in the most economical and safe way possible.

When you're rehabbing, you probably want to focus on eliminating the food, water, and shelter the most for pests. So, we really are going to try to hit these points in the next few slides with a lot of pictures.

The priority pests I'm really focusing on in my work are rodents and cockroaches. I also do a lot with bedbugs. But for this presentation, we really just want to focus on these health hazards, the rodents and cockroaches.

As Ellen mentioned, there is a very strong correlation between rodents and cockroaches and asthma. Ellen shared this graph with me that shows as the infestation rates in homes increase, so do emergency room visits for asthma related complications increase. So we know that, that's an established fact. So for the residents and for the people working in these buildings, it really is to everybody's benefit to reduce the allergens.

Mice, we know in addition to the allergens and asthma that they carry, they also drip urine everywhere. Think about most people have encountered mice in their home. Probably about 80% of homes in the US have had mice. So, they drip their feces and their urine everywhere. And everywhere they go, they're spreading the allergens and the diseases. Some of the diseases we've heard about recently in the news, the hantavirus, leptospirosis, rat-bite fever, salmonella, murine typhus. So, this is a real concern. Not only the diseases, but also they chew wire, so that could be a fire hazard, as well. So, you really want to eliminate mice.

I'm not going to get into this, I just want to mention that there are CDC recommendations for cleaning up mice urine and nests, because you don't want to become exposed to the pathogens. The key here is, we don't want to stir them up too much. You want to wet them down with a disinfectant before cleaning.

So, the first step when you are looking at a building to rehab, probably you want to identify the pests and the conditions that might help pests along a little bit. And to do that, you should probably do a thorough inspection always using a flashlight to look in the cracks and crevices, or a telescoping mirror that a lot of pest control technicians use. And there's the fancier version, which is a Wi-Fi adapted endoscopic camera that you can really get into places where a person cannot get to. It connects to your cellphone.

The picture in the middle shows, you've got to think about all these little places that they hide and possibly eliminate some of these hiding places. Because when pests are hidden like this, what I'm showing in the middle is a cockroach. I'm pulling back the cove base molding, and there's cockroaches in there. If the pest control technician in this case didn't know where they were, they were not going to apply the pesticides in the appropriate places. And these guys in the cove base are perfectly fine and happy and thriving. So, knowing where they are and know the conditions that will help the pests along. If you don't know if you have pests in a building, there's monitors, these sticky traps for cockroaches and other bugs. And then, edible nontoxic bait that actually could be used for rodent detection. It turns their droppings a lovely fluorescent green so you can figure out where they are.

The next step, the most important step, especially approaching fall and late summer, is doing an exterior inspection for pest entry points. In the late summer and fall, rodents are circling buildings. As soon as they feel a warm draft of air or a delicious smell of food, they're going to beeline towards that opening. They really only need, mice need a hole about the size of a dime to get into a building. My favorite rodentologist, Bobby Corrigan carries around a pencil with him, and he any place that he can stick a pencil in, he says that has to be sealed. It might not be big enough for an adult mouse or rat to get in, but that's big enough for them to start chewing and make a hole that they can get into.

So, pay attention to these tiny holes. The door sweeps I see chewed here. The space between two doors, it's called astragal gap. They do make a sealant for that. And then, of course, where your pipes and your electrical conduit and all the utilities come into buildings. We have to seal up those holes. And here's some more door problems I commonly see. The chewed door sweep. The door propped open. That's not a rehab problem, but just a common problem.

And then from the inside of the building, you can look for light shining through doors to find those holes that need to be sealed. You inspect the interior and look for the holes, as well. This is the most common place I see mice and cockroaches going through buildings, from room to room, or from apartment to apartment, under the sink. So, you can see these nice holes, and the picture on the left has some nice cockroach droppings to let us know that's their highway. The picture on the right is a pipe collar that's loose from the wall, and it's not installed correctly. You really have to install these. That's great that they have a pipe collar, but it's not installed correctly.

Other places they can get in, pipes, screens, busted screens, the baseboard heat has been an issue. In every building I've seen that has a rodent problem, they use the baseboard heaters to travel from room to room, unit to unit. And then also, this is a picture of a appliance pulled back from a wall that has a ton of grease. So, that's not an entry way, but that is a source of food. So, pulling back appliances, looking what's behind there, and cleaning that. I can't tell you how many times I've seen this type of thing just painted right over, cockroaches and all.

If you're working in multifamily housing, there's probably some sort of trash disposal system. That has to be looked at, assessed, cleaned regularly, and treated. Source of food. You have to look at your trash

receptacles for the building. Trash is a great source of food for rodents, and we have to make sure that we have adequate receptacles. The picture on the left is a hole in the dumpster. And the picture on the right is just not enough garbage cans for that size building.

You have to, of course, Ellen mentioned addressing moisture programs. Mice don't necessarily need a lot of water, but cockroaches very much so need water. So, addressing these moisture issues, especially under the sink is where we see most of the pest problems in homes, in the kitchen and bathrooms where the food, the moisture, and the heat is.

And then, develop an exclusion plan. Keeping pests out is very important, keeping them out of the building, but also limiting where they can hide. So what I'm showing here is some really good caulk jobs done at unit turnover and renovations where they've caulked around the kitchen counters and cabinets so the cockroaches can't get behind there and into the cabinet voids. And then also caulking around exterior plumbing and all these holes in the exterior that can be access points for rodents, as well as other pests like ants.

Use materials that are durable. I have an X through that foam caulk, the foam sealant, because it's useless unless you used it with a metal mesh material. So, use durable materials that are made to last, because you want to do these jobs once. These excluder door sweeps are expensive, but they should only need to be replaced once. They have metal mesh on the inside so they can't be chewed through. The copper Stuffit is another great material. You can stuff bigger holes that you can't caulk. If you want to hold it in place with the spray foam, fine, but don't use spray foam alone. That spray foam that's supposed to be rodent proof is not. In the bottom picture is a \$2.00 termination plate put around a gas line. So, that is nicely installed.

Here's some more nicely installed exclusion measures. We saw that there were chewed nuts and evidence of rats going in that pipe. I think it was emptying out a sump pump. We put, the homeowner actually put the metal mesh screen on that cannot be chewed through by rodents. And then, another nicely sealed under the sink.

Also, look at your landscaping for pest prevention. Keep your vegetation at least a foot away from the foundation. Any foundation that touches the building even tree branches that are hanging over a home or a building allow access points for rodents like squirrels, and ants.

And, of course, you can remove the pests yourself by using mechanical tools. You want to use a HEPA vacuum for cockroaches and plain old traps for mice. These don't take any kind of license to apply. But if you do want to apply chemicals or if you do have a pest infestation that requires chemicals to be used, you want to hire a professional to do that. Because they know what the conditions are, they know the right pest chemicals to use, and they will apply them correctly.

And if you want more information, I couldn't get into a lot of details, I just wanted to show you my common pest entry points, but these two resources are fantastic. Pest Prevention By Design, and the New York City Department of Health has a great pest and pesticide guide as well, that walks you through, with more detail, some of these exclusion techniques.

And then, after you've done rehab, you want to consider making a new IPM plan for your building. I just want to put this slide up of my website, StopPests.org, that can help you with all sorts of resources. HUD also has some guidelines on IPM that are pretty good, as well. You can find those one my website or search for IPM HUD. And with that, I am done and I will hand it back to Ellen.

**Ellen Tohn:**

Great. Thanks so much, Susannah, for the tour de force going through how to do pest resolution. We've gotten quite a few questions. I've been responding in the chat, but I'm going to see if I can quickly answer a bunch of these.

Donna from North Carolina helpfully points out that EPA has been backing off of their Zone 1, 2, and 3 rating because, of course, you can find radon risk in Zone 3. That's true. I think for these guidelines, the sense of if you had to pick a priority, if you're in a state that has greater risk, this is really got to be on your radar screen to be testing for radon. So, not to say there aren't risks in Zone 3. So, certainly recommend testing in all locations.

And a question about Puerto Rico and the Virgin Islands and homes that are naturally ventilated, not very well insulated. Could there be radon risk? You don't need a home to be insulated for us to have radon risk. If there's radon from below grade and it gets in the home, it could happen even in a home without insulation. I'm a little less familiar with radon risk in Puerto Rico and Virgin Islands, so happy to follow up directly on that one. I don't want to speak to that specific location.

And then one more question on radon was, do you recommend radon testing if the home's going to be demolished? The guidelines do not currently suggest radon testing if the home's going to be demolished because there would be nothing to mitigate. I don't know, Teri, for a demo, are you guys doing any radon testing in that context?

**Teri Provost:**

No, absolutely not, because you're not actually harming anyone. There's no occupants. So from HUD's standpoint, we want to make sure people are safe when we put federal money into it. So, no.

**Ellen Tohn:**

I think the question had to do with the demo, maybe the crews doing the demo. But, radon is a long-term exposure that you have to be exposed, I guess, for a pretty long period of time. So, we're not as worried about someone having that exposure for a shorter amount of time, unless the levels are quite astronomical.

Do you recommend carpeting bedrooms where people sleep? And, do you recommend no carpet in bedrooms? So in this section, we were talking about contaminants. In a future section, we're going to be talking about keep it clean. And the guidelines don't currently recommend no carpet in bedrooms.

I have worked with several rehab programs that minimize carpet and avoid the use of carpet in bedrooms just because we have such a high percentage of folks with asthma. And being in a bedroom with a lot of dust, which can accumulate in carpets, or get moist and create other allergen risk can be an issue. So for many asthmatics, that can be a very helpful setting to have less carpet, because also a lot of occupants may not own a vacuum cleaner which is the most effective way to clean carpet. So, certainly it's a good choice. It wasn't something we included as a high recommendation in these guidelines, but it certainly would make some sense.

Let's see what else. For radon, in the precautionary measures I mentioned covering dirt floors in basements. That's really using a six-mil poly, and taping the seams. There's some good guidance from EPA's Healthy Indoor Environment Protocols for home energy upgrades with more details. And Health@Home Guidelines spell that out a little bit more. But it's essentially poly and taping seams and going up the sides.

And, my thoughts about passive radon mitigation during construction. Fantastic idea. If you can install a passive mitigation, a sub-slab, if you're doing new construction, that gives you a pretty good chance of not ... it's best to do it when you're building a new building. So, certainly, that's an excellent choice in new construction if you're in an area that tends to have radon. It's much less money to do this initially. And then, after that's installed and the home is built, you would again test for radon. And if the levels unfortunately are still above four, it's very easy to add a fan and use that passive system and active system.

All right. I don't know. We're at 4:00, so I did the best I could on those questions. I'll hand it back to Lael to wrap us up I think. Lael?

**Lael Holton:**

Just wanted to let you all know we do have some limited on-call technical assistance available to incorporate your Health@Home Guidelines into your current rehab standards. We probably have some funding for about three to five recipients we can assist. So, please submit a technical assistance request to energyaction, one word, at [hud.gov](http://hud.gov) by July 30th.

A couple of other things here just to close us off. This webinar is being recorded, as I mentioned earlier on. All other presentations are also being recorded and are available on the Health@Home Series website that we have. When these materials are complete, it will be sent out to you via email the same way as your registration information, including the link on where you can go to download the presentation. And since we threw an awful lot of information at you, a recording of this so you can kind of go through it at your own pace again a little bit later.

For those of you who do attend all four trainings, as well as whether they're live in person like today, or you re-watch them, you do have the ability to get a certificate of completion. However, if you did not watch a show live, you need to email me at the [communitycompasstraining](mailto:communitycompasstraining@aecom.com), one word, at [aecom.com](http://aecom.com), and let me know that you completed the training. That way, I can get you the credit for it and we can get you a certificate. I need that after the series is all over, and we need it within about 30 days, so by November 15th I need to provide that information.

Again, on this slide is the main Health@Home website where the guidelines are available for download, as well as just to walk you through some of the standards and the information that's there.

And just a reminder, our next visit with you all we'll be talking about keeping a home dry and safe. It'll be on September 10, 2020. We're going to give you the remainder of the summer off. Enjoy the time with your families, and just enjoy the break for a minute or two. Hope everyone does stay safe between then. We really appreciate your attendance and your participation today. If you had some other further questions, you can forward them on to [communitycompasstraining@aecom.com](mailto:communitycompasstraining@aecom.com), and I'll move them on to the panelists.

I'd like thank Michael, Ellen, Teri, and Susannah for participation today. With that, we're going to shut the webinar down. Have a great afternoon.