

## **HUD's Multifamily Accelerated Processing or MAP Guide Industry Briefing, Session 4, 3/9/21**

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Our presenters today are as follows. Sara Jensen, a housing program environmental clearance clearance officer, Dr. Peter Ashley, director of the Policy and Standards Division at the Office of Lead Hazard Control and Healthy Homes, and Kyle Hoylman, chair of the ANSI and AARST Executive Stakeholder Committee.

With that, I'll go ahead and turn things over to Sara Jensen.

Sara Jensen: Thanks so much, John. And welcome, everybody, to our webinar today. The 2020 MAP updates make several changes to multifamily FHA radon requirements. Most notably, the updates remove the zone three exemptions for 223(f) and require 100 percent ground floor testing instead of 25 percent ground floor sampling.

Today, we are going to go through MAP Section 9.6.3 in its entirety. We'll cover big changes, small changes and requirements that are unchanged. As John just mentioned. I'm joined today by two radon experts for today's webinar. And we will have time for questions at the end of today's session. Dr. Peter Ashley is going to start us off with an overview of radon health risks and some background on the science behind the two big radon policy changes in the MAP guide. Peter?

Peter Ashley: Thank you, Sara. Great to be with all of you today. I'm trying to advance the slide here. Okay, there we go. So, what I'm going to do, as Sara mentioned, I'm going to talk a little bit about why we're concerned about radon, what it is, and why it's a health hazard. I'm going to go over these slides pretty briefly because we really want to save enough time to go over the MAP guide changes. But I also want to talk about some of the science related to the MAP guide changes.

So, radon is a naturally occurring gas. The 222 on this slide is the atomic number of radon. If you can remember back to your chemistry classes, the number of protons and neutrons that make up the atom. You can't see it or smell it. It doesn't react with anything. It comes from the the

breakdown of uranium and it takes a long time. Uranium breaks down to radium and radium, over the years, breaks down to form radon gas, and that's released into the soil. And it can come up through the soil and into buildings.

And I'll talk a little bit more about that. It can also enter buildings through water, especially water from wells, and through natural gas. Now, the numbers on this slide that you see under uranium and radium, and for radon, that shows you the half-life of these elements. And that gives you an indication of how stable they are, how long they take to break down as part of the decay process.

So, you can see that uranium has a half-life of 4.5 billion years. So, it takes a long time to change to radium. So, this slide just shows the different pathways through which radon can enter the air around us and then where it can enter buildings and be concentrated because it's not diluted by the outside air. Especially through cracks and through openings for fittings and basements or and slabs, if you have slab construction.

And as I mentioned, through water, especially if you have well water. This slide shows you basically the K-pathway for radon. And I mentioned the half-life concept and you can see the wide range of half-lives for these products that are part of the radon decay chain. And when these elements are transformed into other elements on this chain, they release energy in the form of radiation.

And our concern with radon and its health effects are with what's called alpha radiation. I'll talk a little bit more about that. But it's radiation that's got high energy, but it cannot penetrate deeply into things. And the two, what we call daughters or progeny from radon that are the biggest concern with human health are Polonium-218 and -214. And they're very short-lived and they're actually very small particles and they can damage tissues, lung tissues when they release the radiation.

So, radon can be taken into the lung, and in the lung, you can be you can be injured or your cells can be injured because of these transformations that I just mentioned. And as I said, the alpha radiation does not penetrate deeply, but the particles adhere to the cells in the lining of the lung and they can release this energy right into the cell and possibly damage the tissue, especially DNA, which can lead to increased risk of lung cancer.

So, this slide just demonstrates what I'm talking about here, showing a double strand of DNA and the potential injury to that or harm to that strand caused by the radiation that's released by these radon daughters or progeny when they release their radiation in their conversion to the next element on the chain.

So, what affects one's risk from radon? It's what you might expect; that is the level of radon or concentration in the air. The higher the levels, the higher the risk. And also the length of exposure. So, you're looking at the total dose over time. And also whether or not a person smokes. For smokers, the risk is multiplicative. So, by a factor of 8 to 10 times.

And even though EPA has established a benchmark for what is considered an elevated radon level, that's four picocuries per liter of air. There's really no completely safe level of exposure.

So that's somewhat of an artificial benchmark. And the EPA suggests that people consider mitigating levels between two and four as well.

So, this slide just puts into context the estimated 21,000 annual cases of lung cancer that occur in the U.S. each year that are caused by radon exposure. So, you can see it's up there. It's in the top 10 causes of cancer. And a lot of people don't realize this, you know, for various reasons that we'll talk about today. But it's been hard.

You know, I'm an environmental health practitioner and my colleagues and me have always had a hard time getting people's attention about radon because it's odorless, colorless. You don't feel its effects. It might affect you. There's a latency period, six to even up to 25 years after exposure it can cause lung cancer. So, you know, with this delayed effect, and then when a person gets lung cancer, you can't relate that definitively back to radon exposure.

So, for all those reasons, it's hard to get people's attention. But it's a very serious risk. And there's a strong reason for controlling it. This is just another way to look at the risk. So, at the current EPA benchmark of 4 picocuries per liter, it's equivalent to smoking about eight cigarettes per day. And, of course, a higher risk as the radon level increases.

I just wanted to talk a little bit about distribution of radon in the U.S. A lot of you probably are familiar with this radon risk zone map that was created by the EPA in the early 1990s, and it's based on a modeling using knowledge of the underlying geology of these regions in the U.S. and also some radon measurements. So, both went into the modeling.

It's useful to show areas of higher and lower risk, kind of from more of a big picture context. You can see states that have a known higher risk. If you look at Maine, you look at Pennsylvania, Colorado. So, these states with the underlying granite containing bedrock, these cases will have tend to have higher uranium levels in the soil, translating to higher radon levels as well. And EPA created these zones based on the expected average levels of radon in buildings, or homes, in these different zones.

But I think it's very important to point out that the EPA has indicated that this zone map should not be used to determine if individual homes or buildings need to be tested. So, it's not really meant to be used on a small geographic scale. Like I said, it's really for getting a bigger picture view. And this is also consistent with HUD's health care programs handbook in which they require testing and mitigation in all EPA zones.

So, this is an example of how using the EPA's zone radon risk zone map could lead you astray. What you see here are three counties in Florida. You can see them circled, that are considered to be in zone three in the EPA map, so that's the lowest risk zone where radon levels are expected to be at generally 2 picocuries per liter. So well below the EPA benchmark before.

But the state has collected test data over time in these counties. You can see that in the table on the left. And if you look at that second column from the right, you see the percentage of these test results that are considered elevated, so that are at or above the EPA benchmark of 4 picocuries per liter.

You can see it's a relatively high percentage, up to 41 percent in the one zip code. So, many of them above, you know, in the range of about 25 to 40 percent. So, you know, at this level, at this scale, you can see that with more data, over time, we've increased our knowledge of the radon risk and it's higher than what might be expected if you just use the EPA zone map.

Next, I want to talk about a study that my office funded. We fund research on healthy homes topics and including radon. We call this the Earth study. A grant was awarded to Health Resources, Inc. that works closely with New York State Department of Health in terms of grant management, et cetera. So, in function the grant really went to New York State's Department of Health.

And what they wanted to do, what they proposed doing is to assess the current requirements at the time they applied for this grant in 2017. The current and varied requirements for ground floor or ground contact, radon testing in multi-family buildings. So, you can see those differing requirements here. Fannie Mae, 10 percent of ground contact units. Same for Freddie Mac. HUD's multifamily program at the time was 25 percent of ground floor units to be tested.

However, the national consensus standard, the ANCR consensus standard, the development of which was supported by the EPA, calls for sampling or testing of 100 percent of ground floor units. So, what's the science say? So that was the question. And then this bottom statement in red is also important, but some states also require 100 percent ground floor testing in multi-family properties within their states.

So, the study collected data from radon professional organizations on 152 properties in 29 states, adding up to a total of almost 8000 residential units. There were quality control criteria that this data had to meet for it to be included in the study. So, it wasn't a random sample, not necessarily representative of multifamily housing in the U.S., but it's a fairly large sample and it's certainly indicative of -- it can give us important information.

So, this table shows you the probability that you miss a unit, that this is a ground floor unit, that has a radon level at or above the EPA benchmark. If you sample at these different sampling levels, so 10 percent, 25 percent, 50 percent. And the far left shows you the footprint of the building, so how many ground floor units these buildings had. And these data are limited to buildings where at least one unit with an elevated radon level, so you can see that down at, if you are sampling 25 percent or 10 percent of the units, there's a high probability that you're going to miss a unit that has an elevated radon level.

You could quite easily in about 25 percent, one out of three cases, you could miss a unit with elevated radon. And you can see that not until you get up to 90 percent sampling, testing of ground contact units, do you get where you're below five percent probability of missing that elevated unit? But you're still, with some of these -- this was developed through statistical

modeling scenarios. So iterative statistical modeling. But you still can see that you're still up to three, about three percent chance in some cases of missing that hot unit.

So, this provides pretty good evidence that the HUD requirement at the time of 25 percent was just not sufficient. So, the researchers' conclusions are summarized here in the slide. I think the bottom two bullets are the most important. So, for all building sizes, three percent of units with radon above the benchmark would still not be identified when 90 percent of units are measured. So, a measurement frequency greater than 90 percent is needed.

And of course, the related conclusion is that HUD's requirement at the time, the 25 percent of ground floor units be tested would be inadequate to identify units containing 4 picocuries per liter or greater. And this, of course, would apply to Fannie and Freddie requirements. Before I finish, I wanted to mention that recently the Federal Housing Finance Agency notified Fannie Mae and Freddie Mac that they would be working with them to update their radon standards, and they will have to meet the current national consensus standards, which basically is what with the MAP guide update, is the current requirement of HUD's multifamily program.

So, with that, I'm going to turn it over. I'd like to thank these individuals for their assistance with my presentation and providing content for it today. Thank you very much for your attention. And I'm going to turn it over now, I believe, to Sara Jensen.

Sara Jensen: Yes, thank you so much, Peter. That was an excellent overview. And for those of you that may have joined late, you just heard from Dr. Peter Ashley from HUD's Office of Lead Hazard Control and Healthy Homes. And my name is Sara Jensen. And let me see if I can move the slide. Yes, I can. Okay. I'm the program Environmental Clearance Officer for the Office of Housing at HUD.

And for the next section of today's webinar, we're going to walk through each requirement of MAP Section 9.6.3, letting you know when something is new or updated from 2016. I will be presenting the MAP policy. And Kyle Hoylman, who's the chair of the ANSI/AARST Executive Stakeholder Committee, will provide details and examples from the relevant radon standards. And he will also share information about upcoming standards updates.

Let's start at the beginning with the radon report. So, the requirement for a radon report is unchanged. The radon report includes results of the testing and details and timing of any needed mitigation. The report must be signed by a radon professional and must follow the requirements of the appropriate standard. Just a note that a printout of radon test results is not the same as a radon report.

For most existing buildings HUD still requires a radon report at pre-application or application. For new construction or existing buildings with substantial rehab or conversion, where early testing is not feasible, a radon report is not required at application, but instead required after the testing has taken place. And Kyle will provide examples of when early testing is not feasible later in the presentation.

Multi-family housing already made this general policy change via the November 2018 radon technical updates letter. The MAP updates now specify that the radon report should be submitted at final completion inspection.

Several people have asked about phased new construction projects. For phased new construction projects HUD will require the radon report at the final completion inspection of the final project phase. For earlier phases, HUD will accept the pressure field extension evaluation results, which are already required under the CC-1000 standard for each building in lieu of the radon report. This approach gives HUD confidence that the radon system was installed correctly and can be turned on if needed, and allows lenders to send radon professionals out once to the site instead of multiple times as each phase is ready for occupancy. This guidance will be included in the March 2018 reposting of the MAP Guide.

Some more comments on the radon report. HUD does not require the radon report with the application for new construction, but does require that the radon mitigation system be included in the architectural plan, HUD relies on the project architect, but encourages that architect to seek technical advice from a radon professional if needed or if required by the relevant standard.

Please note that if there's an issue with either the design or the implementation of the radon system, any needed post construction radon mitigation must be complete before final endorsement. There are several upcoming ANSI/AARST standards updates and Kyle will talk about them as we move through the webinar. Right now, I'd like Kyle to comment on coming updates to the CC-1000 standard. Kyle?

Kyle Hoylman: Sure. Thanks, Sara.

So as part of planned harmonization to the full suite of standards maintained by ANSI/AARST, CC-1000, which is the passive soil gas control system standard for new construction, will be updated to harmonize with the measurement mitigation standards, to include the definition of qualified professional and the requirement that the qualified professional supervise all activities. And in the example of CC-1000, those activities would include the design, installation as well as the PFE, performance evaluation. Anticipated publication date for the harmonized standard is Q2 or Q3 of this year and then an effective date of six months. So, we're looking at publication mid-year with an effective date towards the end of the year, Sara.

Sara Jensen: Okay, great, thanks Kyle. So, as Kyle noted, this is a little ways out before it's the requirement. And I would also just note that this is new and came to HUD's attention after the MAP updates. So, we will be having discussions about what this means for implementation and if we need any changes to the MAP guide. So, stay tuned for more details on that.

So, this is a good segue into radon professional. There is no change to this section of the MAP guide. But as a reminder, HUD requires the radon professional to have a national certification and a state license or certification in states that have that requirement. Many states with license or certification standards have their own radon standards as well. If these are different than HUD standards, applicants must meet the minimum requirements of each standard.

HUD requires that radon testing, post construction, radon testing, and any mitigation required as a result of that testing to be performed by or under the direct supervision of a radon professional. We know that restrictions due to COVID-19 can make this difficult. So, Kyle is going to discuss accessibility options for COVID within the current MAMF testing standard.

Kyle Hoylman: And actually, Sara, one other item just to clarify. Peter had mentioned the state requirement, some states requiring 100 percent ground contact before the 25 screening was updated. So just a quick discussion on that. What is the radon professional required to follow? So, we have the MAP guide policy versus any applicable state laws or regulations. And the answer is the radon professional is required to meet the minimum requirements of both.

So, a perfect example would be Illinois. In 2013, when the original policy was pushed out, Illinois had a requirement for 100 percent ground contact testing. So, the radon professional needed to meet that minimum requirement, whereas the requirement with HUD at that point through the MAP guide was for 25 percent. However, the MAP guide points to the ANSI standard, which required 10 percent upper floor testing. At the time, Illinois did not require that. So, the radon professional needed to meet that minimum requirement.

And that's how the standards are applied on a state-by-state basis. The minimum requirement of the policy or the MAP guide, as well as the minimum requirement of the state law or applicable regulation. And as you said, just a quick example of some accessibility options that came up during the pandemic. So, the challenge was we're not able to get into certain sites. Access is an issue, as you all know, radon, you place the device, you wait a couple of days and then you retrieve the device. So, we have two entrances into the residence.

And the actual standard supports the solution. And this is an existing section of the standard. And basically, there's two components here. The first component is, as Sara mentioned, the testing needs to be done under the direct onsite supervision of the qualified radon professional. However, that radon professional can mobilize to the site and can utilize non-qualified persons for measurement. So, these folks can assist in the placement and retrieval of devices. The requirement would be to name and record the qualifications in the project-specific QC documentation as well as to develop a specific work plan for that particular project.

In practice, (next slide, Sara), the way that that would work would be the radon professional would develop the testing and the QA plan as they normally would. The qualified professional would mobilize onsite and provide that training on the deployment and retrieval to the non-qualified persons, document that, have it signed off on for the project-specific QC plan, and then that professional is on site. So, if something comes up, they are there to answer and respond to any issues that arise.

That allows the devices to be logged and most importantly, the chain of custody to be maintained by the qualified professional. And then the back end of that is just the same. So, the radon professional would review the results and develop the report for submission. So, there is a viable option for accessibility issues when they arise. A couple notes. The practice -- we're aware that this practice takes place of utilizing non-qualified personnel is not permitted unless the radon professional is physically on the project site to provide that supervision.

And then the last thing would be, obviously, this approach would need to be verified with the state that the property is located in just to make sure that there's not a minimum requirement of some sort that would prevent this approach. At this point, I'm not aware of any state. This practice has been utilized quite frequently and we really haven't see, any issues with this approach.

Sara Jensen: Okay, great. Thanks, Kyle. Now let's move on to exceptions to the radon report. There are two changes to this section of the MAP guide. So, Peter actually has already discussed why multifamily removed the exception to radon testing for 223(f) projects in EPA zone 3.

The second change was to tie testing or mitigation exceptions from a radon professional to the relevant state or ANSI/AARST radon standard. So, before I hand over to Kyle to provide some examples from the standards, I want to note an exception that has not changed from 2016. It is still the policy that a radon report is encouraged but not required for 223A-7 application. So, Kyle, will you walk us through some examples?

Kyle Hoylman: Sure. So, some examples of exceptions, obviously, if the testing has been completed within one year of your application submission, that would be a valid exception. Properties that have a current OM+M program that would be compliant with the standard. I could see that being a valid exception request because those properties are being maintained with regular monitoring that's ongoing. Another exception example on the testing side would be wood frame construction on a raised open-air platform or foundation.

A lot of you might ask, well, how about garages under the building? A lot of times you see when you run into that. South Florida is a perfect area of the country to talk about.

The reason that we're not accepting that is because radon emanation. It's actually coming from the building material. The buildings are more tightly constructed with a lower air change rate, and therefore we end up seeing not problems coming from radon intrusion through the ground, but we end up seeing issues with radon emanation from the building material. So that's why we wouldn't see an exception for that.

With mitigation, it's pretty straightforward. Either mitigation is required or not. So, there's really not an exception to say that any instance of mitigation being required from testing would lead to about a valid exception.

However, in the new construction, there is an exception for fully ventilated garages. We run into that a lot. It's actually Section 4.8 of the standard, and it points to ASHRAE 62.1, which is a standard to verify the pressurization of enclosed spaces surrounding the garage. And that would be run by the engineer and then recorded by the qualified radon professional. And again, just to note, as Sara said, these exceptions under the new guidance must be documented in writing by the radon professional and refer to the applicable section of the standard.

Sara Jensen: All right, thanks. So, let's move to testing protocols. This is another area where there's a big change. The MAP 2020 updates eliminate the 25 percent sampling exception and



requires 100 percent ground floor testing and 10 percent upper floor testing per the standard. Peter has already discussed the results of the Earth study and the additional protection this will provide residents. I want to add that this change will also eliminate a lot of confusion and delay regarding retesting when the 25 percent sampling reveals elevated radon.

And that brings me to the next point. Section 9.1.1D of the MAP guide states that HUD requires the most recent edition in force or superseding document for all standards. That clause means that we don't have to keep repeating "or latest edition" whenever we cite standards. So, as Kyle's mentioned, coming soon are some updated standards, including an updated MAMF testing standard. And that standard will include clear guidance on the number of valid measure results for building characterization, among other helpful updates. So, Kyle, can you walk us through and also give us an idea of the timing of that update?

Kyle Hoylman: Sure. From a timing standpoint, you noted that the revision is March of 2021, so the publication date, the standard has actually been published. And the effective date of that is six months from the publication date of the standard. Now, as far as adoption or field adoption of that, the contractor would really have the opportunity, subject to state requirements, that wouldn't prevent this. But the contractor would have the opportunity to adopt the new standard prior to the effective date. In this instance, the effective date will be September of 2021.

As far as the clarification of some of the revisions, as I mentioned previously, there is ongoing harmonization with standards. And one of the big things that has happened between the MAP and lien guidance, MAP uses the multifamily guidance; the lien program uses the large building, is they're now harmonized to be a minimum measurement period of 48 hours. Previously, that was 48 hours on multifamily and 72 hours on large building.

One of the things that it made it into the harmonization that is beneficial for multifamily, is the large building standard provided for the evaluation of occupied versus unoccupied concentrations. So that's now applicable to multifamily. So, if you have a nonresidential area that may only be occupied eight hours of the day or the area has fresh air makeup from the HVAC system, you are able to use an additional line of evidence which would be occupant exposure to assist in whether mitigation is required or not. So that that's a change as well.

A big change that is beneficial is the concept of occupied and non-occupied locations. Previously it was, is the location occupied or can the location be occupied? So, we would see a lot of things like storage rooms and basements that technically could be occupied with minimal renovation, and they would be tested. This change would require only locations that are occupied or intended to be occupied at the time of the testing event to be included in the measurement event.

So that's going to streamline this. That's going to make it a lot more flexible and easy to interpret what should be tested versus not. And the caveat here is, of course, if locations that were not occupied are intended to be occupied at the time of the testing event do become occupied in the future, the recommendation is that they be tested prior to occupancy. So that's a pretty significant change that is beneficial to characterizing buildings and moving forward.

Disagreement and measurement results. It's not uncommon to see measurement results that will come back based on seasonal testing or differences in environmental influence. And this was previously as a QC item, but now has made its way into the standard. And that's when the higher result is above the action level and the lower result is below the action level. And when that higher result is two times greater than the lower, then additional testing is required unless you're choosing to proceed with mitigation.

So, if you go out today and put a test device in and it's a 4.0 or an 8.0, and you would come back in three months and do a follow up and the follow up came back at a 3.0, instead of just simply averaging those and saying mitigation is required, you would have the option to say, the three, the eight is two times higher than the three. The three is below the action level. Therefore, we're going to take a step back and maybe do some additional diagnostic testing to make sure we're mitigating something that actually requires mitigation.

And one of the final areas here that is of great interest is the extenuating factors. You know, it's not uncommon to go into buildings and see access not permitted due to pets or doors that aren't keyed properly. And so, this is a departure that, again, is another benefit. So, it recognizes that extenuating factors do come up. And instead of just saying, hey, these things have to be retested or providing some arbitrary guidance to that, there's now clear guidance.

So, the building may be cleared when all locations in the building that have a valid result of less than or equal to two are present. And then it's just a simple table. So, if there's four to seven ground contact units in the building, you could have one invalid unit in that building and still characterize the building, eight to 11, two invalid results all the way up to 20 or more with five invalid results.

That makes characterizing the building a lot more straightforward and a lot easier to interpret the application of the standard for extenuating factors. And of course, with any of these options, if the client is proceeding with mitigation, then you can throw this or set this aside and just proceed with how the client would choose.

Sara Jensen: All right, great. That sounds like that would be really helpful. Occupant notification. This section is unchanged. So just to remind you, the MAP guide still requires occupants to be notified for testing and also informed prior to and after mitigation activities.

Okay, mitigation standards. Another reminder, we've already said this, but the MAP guide requires the use of the latest standards and another of the coming standards updates is the radon mitigation standard. So Kyle, will you walk us through a few highlights?

Kyle Hoylman: Sure. A couple discussion points here, Sara. The publication date for this standard is also March, so you'll have an effective date of September, and again, the contractor can choose to adopt voluntarily the updated standard as long as it's not in conflict with a state law.

Another item that is coming up more frequently is the use of this standard for chemical vapor intrusion or vapor encroachment. And so, yes, this standard is harmonized for that. So those of

you who run into those issues and have those questions, the ANSI/AARST standard does include provisions for vapor intrusion related to mitigation and ongoing operation maintenance and monitoring. And that would be an appropriate standard to apply to mitigation.

I think the other question is, can you use a radon mitigation system to mitigate chemical vapors? And the answer is yes. A radon mitigation system is basically a vapor mitigation system unless you're dealing with an explosion-proof type of contaminant. And then there's some special provisions. But again, those provisions are covered in the standard. So entirely appropriate when you have a Chemical VI issue to apply the standard to that.

As far as harmonization or new updates, there's really nothing new. (Next slide, Sara.) There's nothing new. I just want to reinforce a couple of things and I'll do this quickly, in the interest of time.

This is an existing requirement within the standard, and that is a diagnostic test also known as a pilot test to go along with the building investigation is required, as well as a system design. And that's prior to mitigation. So, the whole concept of worst-case scenario budgets, the firm budget is what you're looking for. And in order to have that, you have to have pressure for that extension test that's required, although you can use like structures on the same property to utilize the same data. So, if you had three different building types and you have nine buildings, you can do your design on those three like structures. And that would meet the requirement.

And then I would point out that a design is actually required. So, the design would include the routing, the location of the components and other mitigation components. So that's an existing requirement that does not change, that always isn't adhered to in the field, in my experience.

Another existing requirement is the active notification monitor, and it's required. And the purpose is to alert occupants, responsible parties of potential system failure. And that notification must include one of the following, either an audible, a visual, or a telemetric notification of some type. (Next slide, Sara.)

This is a beneficial enhancement to the standard, and it is an existing. But in buildings where you're not able to find acceptable discharge points, there is guidance for that and you will see how that comes into existing mitigation systems here in just a moment. But you are permitted in the multifamily standard to discharge below the edge of the roof as long as all the other requirements of Section 6.4 are met. Those requirements are separation from operable openings into the building and separation from occupant exposure, like venting directly onto a deck, things like that.

So, if you have the inability to comply with 6.4 and you're located, you can't discharge above the point of the roof because it's a flat roof and there's an occupant exposure issue here or the edge of the roof is 20 feet, then this basically applies. So, the exhaust point would have to be greater than 20 feet above grade. And then the only additional thing here is instead of testing the ground floor for clearance or in addition, I'm sorry, addition to testing the ground floor for clearance, you would also just test the occupied location that immediately adjoins the exhaust point. So some more flexibility in application of the standard for multifamily buildings here. (Next slide.)

Just briefly, electrical. I put this in because we run across this a lot in the field. Exterior buildings are -- your disconnect needs to be within six feet in line of sight of the fan, whether it's on the exterior or the interior. You can see the rightmost picture. There's your conduit, the gray, and you've got a closed service disconnect.

So, that's a compliant system. When outdoors, you need the conduit. And there are no plug disconnects permitted. You can see here on the left, the bottom left. That would be a violation of standard. You've got non-conduit and no service disconnect, and then you can't chase through system piping, so the top left would be a violation of standard. You can't run through the conveyance pipe and plug into an outlet.

And then the other is when the building is mitigated, you can't tie directly into a specific unit. Most states prohibit that practice anyway.

And the last thing here is just upon completion there is a PFE recording that's required by the standard. And again, this is an existing requirement. It's not an update. And the reason for this is just to make sure that the design that you were required to complete in step one actually is verified to function correctly on the back end of the project. And then again, just to note, if your exhaust point is below the edge of the roof, you would also need to test that adjacent area.

Sara Jensen: All right, thanks. And as John noted at the beginning, these slides will be available and they'll be a good resource when they're posted along with the recorded webinar. So, let's move to mitigation timing. We actually did not intend to make a change in this section. So, mitigation for new construction and sub-rehab must be complete before final endorsement. So, the same as in 2016. I've highlighted final endorsement in red because the December 18th, 2020 MAP guide version says something else that is not correct. And this will be fixed in the March 18th reposting.

So, remember that we want the radon report at final completion inspection. And the radon report must include the mitigation details. But the actual mitigation, the mitigation reports, the follow-up testing and certificate of completion are due before final endorsement. Also unchanged is the mitigation timing requirement for 223(f) projects. These repairs must be completed as quickly as practicable and no more than 12 months after closing.

Operation and maintenance plan. So, this is a new section in 9.6.3, but it is actually not a new requirement. HUD requires an operation maintenance and monitoring plan completed under the appropriate ANSI/AARST standard for any mitigation project and for any existing active mitigation system present on the property. It will be a condition in HEROS to the firm that the borrower operate and maintain the OM+M plan for the duration of the insured mortgage.

We actually won't have the final OM+M plan at that time, however, because we won't have the part numbers and other details until the system is actually installed. The final OM+M plan is required before final endorsement or when the system is installed for 223(f) deals. And Kyle is going to give us some additional details on the OM+M plan from the standard.

Kyle Hoylman: All right, a couple of bullet points here, just the qualified radon professional would be directly supervising the OM+M program because of the testing and monitoring as well as the maintenance requirements. The program plan itself needs to include the system design and specifications. We talked about those requirements in the mitigation section.

You need a design, you need verification that the design is effective. So, fan specs, warranty, service contact, so on and so forth. The measurement results and any applicable contracts and warranties, building permits, as well as an estimated cost of operation.

The ongoing obligations. Your long-term stewardship for these systems would be routine maintenance and inspections. That's typically done quarterly and that's done by the site personnel. Ongoing equipment inspections; that's typically done annually or every other year. And the qualified radon professional would typically do that. Non-routine routine maintenance items on an as-needed basis. And that's typically done by the site personnel under the supervision and general supervision of the radon professional.

And then finally, the monitoring or the measurement. It's two years for any location on the mitigation plan, and five years for the property. So that would be the OM+M requirements for the MAP guide.

Sara Jensen: Okay, great. Another new requirement for 2020 is a section on existing mitigation system. It requires that all existing mitigation systems be evaluated to ensure they function properly. And if needed, corrective action must be taken by a qualified radon professional.

So, I've received a number of requests for clarifications on this new requirement. First, you can evaluate the system against the standard under which it was installed or the current standard. To use the older standard, you must have documentation confirming which standard, was it ASTM, was it ANSI/AARST? And which version? If you can't find that documentation, then you need to do the evaluation against the current standard.

And you might actually prefer to evaluate against the current standard because it offers that flexibility and design that Kyle just went over. And I think we'll talk about again in just a minute. A little bit more on the guidance. So, if any systems are defective, they must be fixed. And no units may have redone over 4 picocuries per liter, and the system must have an associated OM+M plan. So, Kyle, you want to talk a little more about this reevaluation?

Kyle Hoylman: Sure. So, when we have existing mitigation systems at the property, it just has to be evaluated to, as Sara said, the standard that was used. From a practical standpoint, that's probably not going to happen. That documentation tends to be hard to come by after the fact. And as Sara mentioned, the new standard is much more beneficial and flexible from a discharge standpoint.

And here's just a couple things. The left here, that would clearly be a deficient system that would have to be modified as part of the project. It's blowing right out. There's actually, you can't see it, but there's a child's playground on the other side of those bushes.

The middle, you can't really tell the discharge point, but it's right under the gutter. You can see the little outcropping there. You've got three issues here. You've got a mechanical ventilation inlet, you have attic ventilation, and you have occupant exposure on the deck, as well as the potential for re-entrainment. So that would be another example of a deficient system that would have to be corrected as part of the project.

And the rightmost, if this building was three stories in height and this mitigation system was moved down so it's not within 10 feet of that upper window, then there's the flexibility I'm talking about. So, under older standards, this would be deficient. But again, using that approach, and I just didn't have a good image to throw in here, if this would be a three-story building, as long as that would be 20 feet in height, there's an example of that flexibility afforded by the new. So, we could simply document that, implement the OM+M plan, and move on with the project.

Sara Jensen: Thanks, Kyle. Did your screen come back or is it still blank?

Kyle Hoylman: Nope, I've got it back.

Sara Jensen: Okay, good. Okay, so cost estimates. This section is not new, but has been updated. So, HUD requires that the lender provide the cost estimate for both the mitigation and the ongoing OM+M costs. And this new section also clarifies that we need the mitigation design and firm budget prior to initial endorsement. And this requirement includes 223(f).

Which is a good segue to the next section, which is all about 223(f). So 223(f) must be tested for radon unless, as we noted earlier, the radon professional cites an exception in the standard, and HUD approves of that exception, or unless the 223(f) is already in HUD's portfolio and it's doing no work beyond maintenance. In other words, it's categorically excluded, not subject to. But remember, that HUD still encourages radon reports in that scenario.

There's no longer a zone 3 exception for 223(f). The testing must be done within one year of the application submission unless the project opts to go directly to mitigation without prior testing. And HUD will use the radon report date as the date to check that compliance.

Sub-rehab and conversion. Sorry, before I get to that, let me just say a note about mitigation. Mitigation for 223(f). Follow the mitigation section that we've already discussed and includes post-mitigation testing. And one thing that the MAP guide notes and I'll just highlight again, is that extensive radon mitigation costs might take your application above 223(f) program cost limits, in which case you would need to proceed under the substantial rehabilitation program. And this is one of several reasons why we need that cost estimate prior to initial endorsement.

Okay, now moving to sub-rehab again. All sub-rehab and conversion projects must test for radon, but the timing of that test may vary based on whether early testing is feasible or not. And mitigation must follow the mitigation section we already discussed. But there are two possible pathways here, too.

So, one pathway is where mitigation is built into the project design. And the second pathway is when mitigation is not built into the project design. So, Kyle, this can be confusing, both of

these, the early testing and how you incorporate mitigation can be confusing. So, Kyle is going to walk us through some of these scenarios. Starting with early testing, feasibility.

Kyle Hoylman: Yeah, and this is one of the areas that we see a lot of confusion with and unfortunately a lot of times that confusion results in unnecessary testing by the client. So just to determine the process here, the first thing is determine the feasibility of early testing. So early testing is feasible if the scope of rehab does not impact the building envelope or mechanicals.

Your typical gut rehab, early testing is not going to be feasible. So, what are the building envelope or mechanical items that we'd look at? Door, window replacement, roof replacement, large foundation areas being replaced, anything that can impact the air changes in the building or the attenuation factor for the contaminant itself.

Mechanicals. If we're replacing HVAC systems or we're adding mechanical ventilation of some sort, then again, if it can impact the air changes or the attenuation for the building, then those would impact the ability to test early. If early testing is feasible, then that one test determines if there's a need for mitigation. So it's quite simple, if it's greater than 4, you need to include mitigation in your sub-rehab.

And I will point out that that's active mitigation. It's an existing building. We don't follow the new construction standard, which is passive. We follow the active mitigation standard. If it's less than 4, there is no additional action required. And what that means is you don't need to test now. And if it's below 4, then a lot of the confusion is, you're now going back and testing again after the sub-rehab, and that's not necessary. This policy would clear that one on the beginning. And then again, I'd just point out that early testing needs to be conducted within one year of your application submission.

Now, the other at this point would be if early testing isn't feasible. So, you have a gut rehab or major renovations that would change the building envelope or the mechanicals. You have two options as the client. You can voluntarily implement mitigation into your project. And again, that's active mitigation. It's an existing building. And you would follow through with that, with your post-mitigation measurement and your OM+M program plan because you have active mitigation ongoing at the building.

The other option is to roll the dice and to not implement mitigation into the project at all. If you go that route, then the post-rehab measurement would indicate if there's additional mitigation that's required and if so, that mitigation would be retrofit. Sometimes that might not be esthetically pleasing. It might go against what the client wants for the building. And so that's a lot of times why we see voluntary implementation of mitigation. But if those aren't concerns, then then this is the pathway to go.

And if retrofit mitigation is required, then again, we're following the standard for active mitigation, we're clearing the building and implementing an active OM+M plan. So that's, in a nutshell, how the sub-rehab program works. Determine if early testing is feasible. If it is, test. And at that point, the recommendation would guide you. Or if early testing is not feasible, either

voluntarily implement mitigation or don't. And either direction is fine, either path ends up at the same place, which is a recommendation for mitigation or clearance of the property.

Sara Jensen: All right, great. We're going to end today with new construction and then we'll have time for questions. So, I see a few have come in, but go ahead and get those in the Q&A so we'll be ready to answer those questions.

So, all new construction projects must follow radon-resistant construction requirements, unless that one exception. Or there may be others, but Kyle gave one exception from the standard earlier in the presentation. As we noted before, post-construction testing is required prior to final completion inspection. If the testing results are over 4 picocuries per liter, the project must activate the mitigation system. And if that doesn't solve the issue, the project may need a retrofit mitigation, and that must be complete prior to final endorsement. So, I think, Kyle, you're going to close this out with -- walk us through the new construction standard.

Kyle Hoylman: Yes. So, a couple discussion points there. There are two standards. There's the large building, multifamily large building standard, which is CC-1000. That's going to apply to 95 percent of the multi-family projects. But the option to use the single-family CCAH standard does exist as well. And an application of that would be maybe a senior living facility that's going through the multifamily program that has a large building. You would use CC-1000 to design that. But then around that, there may be 35 villas, duplex buildings. You would have the opportunity to use CCAH for that, which are slightly different requirements.

So just keep that in mind. And again, underscore here that the new construction standard fully harmonizes chemical vapor intrusion. So, your mitigation and your OM+M requirements would be included within that C-1000 passive soil gas control standard.

As far as clarifications, I think we just want to talk about the exemption and that goes back to ASHRAE 62.1. So, when we have those ventilated garages that are under the building, a passive soil gas control system is not required as long as the building meets requirements for ASHRAE 62.1, which is the enclosed spaces, positive ventilation.

And you would document that through your engineer confirmation. So, the project engineer typically writes a letter that confirms that 62.1, 5.15 and 6.1 apply and then the qualified radon professional would provide an exception letter and include the engineering confirmation.

Pressure filled extension. And again, both of these are existing, so they are not updates to the pending CC-1000 harmonization. These are already requirements in the existing standard. After the slab has been cast and prior to the verticals being installed, the system really needs to be verified to be effective if it needs to be activated. And we do that through evaluation of the sub-slab, applying them through PFE testing.

That testing includes connection of the fan to the exhaust risers and measurement of the induced vacuum of predetermined slab points. And that is required at each exhaust riser, on each foundation. And that's an interim between the flat work on the building being done and the verticals going in. And that, again, is a requirement of the of the existing standard. And then



those would be recorded. And as Sara mentioned previously, that would be able to be used in lieu of testing on a phased approach. So, a little more flexibility there for you as well.

And then the final is just the OM+M program plan requirements for new construction. So, what goes into the OM+M plan? It's your system design and specifications. If you have an active system, then you would include your fan specs overall, your system design, your warranty information, your measurement results, all of your PFE evaluation results for sub-slab for each building would go in as far as your performance testing. And then again, all of your contracts. And if you have an active system, then your estimated cost of operation.

Your long-term stewardship obligations would include your routine maintenance and inspections. And again, that would be if the system is active. And that would be done by existing site personnel. Your ongoing mechanical inspections, if you have an active system, your routine and non-routine maintenance inspections on an as-needed basis if you have active systems.

And then finally, your monitoring requirements. If you have a passive system, the first step of your OM+M is to do your seasonal verification. So, if you constructed it and tested it in August, that's a cooling season. The first step of your OM+M is going to be to verify the effectiveness of the system in heating season. And that's for passive systems.

If you have active systems, any location that was on the mitigation plan every two years. And then for both passive and active, it's a five-year characterization of the property.

And that, I believe, Sara, wraps up the guidance on new construction.

Sara Jensen: Great, thanks. Okay, this is great. We have time for questions. Before we open up for questions, I just want to let everyone know that multifamily housing is now using an ask a question portal for MAP questions, including radon. So, we will answer as many questions as we can right now. And if we don't get to your question or if you have follow-up questions, we ask you to submit your question via the AAQ portal. And of course, any project-specific questions must go to the regional staff processing your application.

But with that, let's see if there are any questions. Chris or Tony, will you let us know?

Chris: Yes. So Sara, this is Chris. There's a couple of questions that have come in. The first one is asking, in the example where the initial test was more than two times the concentration of the follow-up test, would the diagnostic testing options include long-term testing?

Sara Jensen: Kyle, do you want to take that one?

Kyle Hoylman: Yes. So, the answer to that question is yes, diagnostic testing could include long-term testing. It could include short-term testing as long as the short-term testing is conducted during a period that would represent normal occupied conditions for the building.

Chris: The next question is asking, can the evaluation of existing mitigation systems be done by the testing qualified radon professional?

Sara Jensen: Kyle, that's another one for you.

Kyle Hoylman: Yes, the evaluation of a mitigation system would be done not by a measurement professional, but by a mitigation professional. And if the measurement professional does possess the mitigation credentials, then certainly they would be able to conduct that inspection.

Chris: Thank you. Another question is asking, what about the use of 91-day and long-term testing if short-term testing is over the action level?

Kyle Hoylman: Sara, I'm assuming you want me to handle that as well.

Sara Jensen: Yes, sorry, I was reading the next question. Yes, please.

Kyle Hoylman: And no worries. So, there are options for 91-day testing. You can start the entire testing event using long-term devices. And if you do that, then it's the result of that single long-term testing event that determines whether or not mitigation is required. Using the extensive testing protocol, which is the one that's most utilized for multifamily, if you were to put out your initial test and your initial test was short-term and it was above 4, but below 8, then you have the option of following up with a long-term test. In that instance, the long-term test would solely determine whether mitigation is required or not.

Another scenario that we see happening frequently, which isn't permissible, if you put out an initial short-term test and that's about 4, and you follow that up with another short-term test and you average, as the standard would have you do, and it's above 4, that is the recommendation at that point. And the recommendation is for mitigation. The ability to retest using long-term devices is not permitted in that scenario.

Chris: Great, thank you. Sara, I can answer this next question. They're asking about the AAQ and if the response is going to be provided to the email where the question comes from, or is it going to be posted on the AAQ page?

So, when you use that AAQ system, the answer is provided directly back to the person who wrote into the question pool. So, it's not published publicly. It's sent back directly to the person who writes the question.

HUD is going to use those questions to determine if there's any trends. Are there any topic areas that people are really confused about? Maybe more training needs to be provided, maybe more guidance. So, they will be using the questions that come in to determine if any future needs or products that need to be developed could be done from that.

So, the next question that's come in, they're asking is radon testing required on a 241(a)?

Sara Jensen: I can take that question, and thanks for answering that AAQ question. Yes, the radon requirements apply to the 241(a) and they would follow the substantial rehab guidance.

Chris: Great, another question that's come in, is they're asking if there is a radon system or systems, should the minimal electrical cost to run the systems be included as an operating expense?

Sara Jensen: Yeah. Yes, so the MAP guide does spell out that we want the cost both of putting in the mitigation and the long-term costs of the operation, maintenance, and management plan to be included. And so, yes, that should be included as an operating expense.

Chris: And the follow-up question to that is, should the replacement of the fans be included in the 20-year R for R?

Sara Jensen: So the replacement of the fans should be included as a cost. Zach, I don't know if you want to comment on whether that would go in the R for R, or if we want to answer that separately.

Zach: Yeah, that question is out of scope for this particular panel. But if you want, you can submit that through a Q and it will get routed to the people that do EC&A and really deal with R for R on a daily basis. Thanks.

Sara Jensen: Thanks, Zach.

Chris: And a great plug, Zach, for the AEQ. The next question is, if all ground floors are tested and there are some units that are above the EPA action level, can you conduct short-term paired testing in each unit to rule out the requirement for mitigation, or do you have to go straight to mitigation?

Sara Jensen: Kyle, will you take that one?

Kyle Hoylman: Yeah, I'm not sure exactly what the person is looking for exactly, but I'll answer it to my interpretation of the question.

So, if you've completed the testing cycle, so you've done a short-term test, let's say you had 10 ground contact units and three of them are above the action level. Based on that, you follow up with another short-term test or as we discussed, you could do a long-term test. And if the average above the action level, at that point, mitigation is required. Simply going back in and doing "diagnostic testing," using paired devices after you've already tested the unit, an initial and a follow up time wouldn't be permitted by the standard.

Now, if you start with the short-term testing and again, that example of 10 ground-contact units, three of them were elevated, your follow up could absolutely include paired short-term devices. But again, the paired short-term device would be averaged with the initial measurement results. So, I'm not really sure of the benefit of that approach because you would just be increasing arbitrarily the cost of the measurement event.

Chris: Great, thank you. This one may be a little out of scope, but I know we have some e-tool people on the calls. They're asking, will the OM+M or any radon reports become required attachments to the e-tool?

Sara Jensen: Yeah, they're required for HEROS, the HUD environmental review online system. They have to be uploaded into HEROS. But if that questioner could follow up on AAQ with that question, we can get that answered.

Chris: Great. Thanks, Sara.

Somebody's asking, can you clarify rooms not intended for occupancy at the time of testing, such as lobbies, game rooms, laundry rooms, et cetera, do not have to be tested for radon? Is that correct?

Kyle Hoylman: That is correct, if the area is not intended to be occupied at the time of the measurement, then it wouldn't be included. Again, with the caveat that if it does become occupied in the future, the recommendation is to test prior to occupancy.

Chris: Great, thank you. Another question is, will the guidance change for RAD or RAD for [inaudible] projects to now include radon testing? They're saying as of now the guidance cites the HN 2013 03 guidance.

Sara Jensen: Yeah, we're working closely with the RAD team to update any guidance that's needed. The main RAD program did incorporate, they do refer to the MAP guide for projects that convert to PBRA via RAD. So, they're already directly following the MAP guide. And we're working to make sure the other programs are aligned as well.

Chris: Great, thank you. Another question. Are there allowable exceptions in the standard that permit skipping testing or limit it, such as 25 percent testing for mid-rise or high-rise structures where collateral begins above the third floors from the ground level?

Sara Jensen: So, I'll take that. That's actually a project aggregation question and the answer is no. So, you need to aggregate the entire building, not just the floors that are HUD collateral. And so, the testing would be 100 percent of the ground floor, plus 10 percent of upper floors, and would not just be from floors three and up.

Chris: Okay, that's all the questions that have come in as of now.

Sara Jensen: Okay, I got a few that maybe came just to me. So, one of them is, and this is maybe a question for Peter. Does fracking in a region increase the probability for radon release?

Peter Ashley: Well, that's an interesting question, and I'm afraid I don't know. It seems like it could. Kyle, do you have any experience with that?

Kyle Hoylman: Yeah, I can weigh in. Very limited experience, Peter, but evidence does suggest that fracking creates the potential for preferential pathways that could lead to elevated radon intrusion, yes.

Sara Jensen: Okay, great. I got another question that maybe just came to me. For new construction does radon testing need to be completed before the HUD final check report or prior to final endorsement? Um, actually, I'm not exactly sure when the HUD final check report comes in, but what the MAP guide says is that that radon testing needs to be completed and the radon report completed before the final inspection. And then if any mitigation is needed, that can take place between that period and final endorsement. I hope that answers that.

Chris: We did get two more questions, if you're open to answering a few more.

Sara Jensen: Sure, and actually there's one more that came to me that I think would be good to clarify with everyone. So, Kyle, this is for you. Can you discuss the difference between ground contact units and ground floor units? It seems that those terms were used, but may not be the same in application.

Kyle Hoylman: Sure. So, a ground contact unit is any location that is in contact with the ground versus the ground floor would be typically the lowest area of the building. A couple examples. If you look at a basement with a first floor that is partially below grade, both the basement and the first floor would be determined to be ground contact.

So, your approach there would be 100 percent of the ground contact areas that are occupied or intended to be occupied in the lowest level, as well as 100 percent of the areas on the first level that are in contact with the ground that are occupied or intended to be occupied.

Chris: Great, thank you. That was one of my questions, too. All right.

Sara Jensen: And Kyle, can I just do a follow up on the related -- but the question about laundry rooms, game rooms, lobbies. Wouldn't be considered occupied spaces, or can you clarify? We don't just mean where people sleep, right?

Kyle Hoylman: Sure. For purposes of the standard, occupied is defined as an area of the building that is occupied more than four hours each day or intended to be occupied for that period of time. So, when you look at anywhere where that occupied area might be. It could be a game room if it's occupied typically for four hours or more, because that meets the requirement.

If it's a laundry room, typically, that's not occupied, and it wouldn't be tested anyway under the guidance. But, let's say it's a storage room. You know, again, the storage room under the previous standard, if the storage room was able to be made occupiable through minimal renovation, meaning is it in the building envelope and is it conditioned? Then it would be tested.

Under the revised standard or the updated standard, that room is not occupied frequently, it's not intended to be occupied at the time of the measurement, and therefore wouldn't be included in the measurement plan.

Sara Jensen: Great, thank you.

Chris: Another question that's come in is how is the tenant notification to be conducted?

Sara Jensen: So, the MAP guide basically defers to the standard on that, so I will defer to Kyle on this question.

Kyle Hoylman: Sure. Notification. There are two types of notification. One is the resident or the occupant notification, and the other is the responsible party notification. So, working with the site personnel, you would notify the occupants of the building, and that's 100 percent of the occupants in the building, including upper floors, because closed building conditions must be maintained.

So, every single occupant and every single unit in every building at the property would receive prior to the device being deployed, whatever the state requirement might be, a minimum of 24- or 48-hour notice. The standard recommends prior notification as well that that goes out, and that notification would include the deployment, the period for the devices, as well as the conditions that need to be maintained.

In addition to that, the responsible party, typically the property manager, would also acknowledge that these conditions need to be maintained during the measurement event and they're going to sign off, that they will make a reasonable or a best effort to assist with maintaining those conditions.

But a big point that comes up frequently, and a good question is who needs to be notified? And the answer is every unit in the building that's occupied needs to be notified, whether it's included for deployment of a test device or not.

Chris: Right, thank you. Just a couple more questions. We only have a few more minutes left. They're asking under the new MAP guide, are you allowed to submit with follow-up testing radon pending, and assume worst-case scenario for the costs of the mitigation in your non-critical repairs?

Sara Jensen: I mean, I think ideally, we would like this to be as close to actual, you know, with an actual plan. I guess I'm not quite following, because you either know. I guess is this a scenario where you don't have the testing yet? I think I might need more information in order to answer that question.

Chris: So, the person that wrote that in, please go ahead and add that to the AAQ system and we'll get you an answer. The last question, we are coming to the close of our time. They're asking if you could just readdress the comment about the percentage to be tested if the first two floors are a hotel or a commercial area and the residential units do not start until the third floor.

Sara Jensen: Yeah, you would aggregate the project together and your radon plan would be for the building as a whole. So, it would be, you know, following the 100 percent ground floor

testing and then 10 percent upper units. I think in that scenario you want to make sure that a lot of your 10 percent units are in the HUD collateral. But other than that, you would follow the standard for the building as a whole.

Chris: Thanks, Sara. That's all the questions that have come in, if you want to wrap this up.

Sara Jensen: Yes, thank you, everyone. Thank you so much to my two co-presenters, and thank you everyone for attending. And please use the Ask a Question and we look forward to hearing from you. And thank you, ICF.

John Panetti: Thank you for attending this webinar. We hope you have or will register for the 5th session of the MAP Guide Industry Briefing Series. Thanks so much, everyone.

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