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Jennifer Williamson: Hi everyone. I'm Jennifer Williamson with the Pacific Northwest National Laboratory, and I'd like to welcome you to today's energy codes commentator webinar on how to show energy code compliance for alterations and additions using REScheck and COMcheck. We hold this webinar the second Thursday of every other month at this same time, so keep a watch on our training page as topics get added. And if you have a suggestion, please email them using the same email that you got the webinar reminder.

Our speaker today is Pam Cole, also with PNNL. She is our resident expert on the software tools REScheck and COMcheck and we appreciate her sharing her knowledge with us today. Pam, take it away.

Pam Cole: Thanks, Jennifer. As Jennifer mentioned we're going to be talking about how to show compliance for additions and alterations using DOEs, REScheck and COMcheck code compliance software.

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So the course description, again, this was out there on the website when you went out there and looked and you wanted to register for this great webinar today. I'm going to go into some details about how to show compliance for only additions and alterations for residential and commercial buildings. And I'll touch on envelope, lighting, mechanical, and service hot water heating and so forth.

Learning objectives. What are you going to take away? Hopefully if you came to this webinar today and you've had questions that I actually hope to address, questions that you've had, if not, we do have a help desk through the codes program and you can send in questions afterwards through our help desk. But what I'm hoping that you will take away is what constitutes an addition versus an alteration. Residential and commercial alteration exceptions. There are several exceptions in the energy code that could apply to your project. And then we'll go into using the software and how do you show compliance for additions and alterations –

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-- using REScheck and COMcheck? So the agenda it's going to be a kind of mix and match. I'm going to give you an overview of the residential code requirements and then an overview of the commercial code requirements for additions and alterations and repairs and then change and space conditioning. And then I will go into demoing the tools. I think it's good to have up front an understanding of what the provisions are in the code because those provisions and as I mentioned, those exceptions, we've implemented those into the software tools. And you can also use the presentation today and you can download it off the website as a resource. So you can go back to this and use this presentation as a resource when you're going through and going through and doing your

take offs for your project in the software tools.

So why do we care? Why do we care about giving you this webinar? Why do we care –

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-- about energy codes and standards? Well energy codes and standards, they set the minimum guidelines for energy efficiency. They will assure that you are saving energy in your buildings over the life of the building. They are a subset to a whole other caveat of building codes, but most importantly they provide, you know, comfort. They're providing cost savings, and they're also economical and environmental benefits that are involved when you are looking at energy codes and standards. And with that, with energy codes, there's several different versions out there and not every state has the same code that they adopt. States are on different legislative regulatory cycles. They may adopt residential different than commercial. So those two could be on two different cycles all together. And this just gives you a quick screen shot. And you'll see all those pretty, nice colors. Those are all different versions of the codes.

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The commercial is on the left; the residential is on the right. And then there is a legend. This map is actually out on energycodes.gov. You can go take a look at it and it gives you a good screen shot of well, what state am I in? Am I an architect that goes to several different states? Then you want to pay attention to what codes would be applicable with what's being enforced in your location for that project because there will be changes and there's differences in of course the different code versions.

And then here's the family of I-Codes as I mentioned. This is giving you a screenshot of 2012, but every three years IECC will come out with a new version. Now we have 2015 in the code cycle or the code hearings just ended and they're getting ready to start publishing the 2018. So I will be showing you tidbits of the 2015 IECC today. And as you'll see way down at the bottom here shows the IECC as one of those family members of the codes.

So what's the structure of the IECC? I think it's important to understand what all is in the chapters of the code.

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And they are similar. For residential and commercial you'll see that there is a scope and application then there are definitions. There's general requirements. Then there is a specific chapter for residential and for commercial. And what was new to the 2015 existing buildings was added. Now in the older codes there still were provisions for existing buildings, but it was not a lot of provisions were there. It was pretty vague and I think with time you're going to see more and more provisions that will get added to provide better details on how to deal with existing buildings.

And then the last chapter is reference standards. There's a lot of references to other codes, other standards and other testing methods such as for fenestration.

So let's dig into the first part of it and I'm going to give you some overviews of the scope of chapter one. Some of the information in the codes are similar for residential and commercial. So let's take a look.

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In chapter one for scope you'll see at the very top I have section and then I have R101 and C101. What that means is R stands for residential and C is for commercial. And those are section numbers in those chapters. And with that said, these are kind of common in the scope. So what is a residential building? That is a detached one and two-family dwelling. It can be a multiple single-family dwelling. It could be a townhouse. I'm showing you pictures off to the right-hand side here. This is group R2, R3, R4 buildings that are three stories or less in height above grade plane. That's residential and all those groups.

Now, if it's not one of those buildings? Well, then it's a commercial building. And actually the definition, by definition in the residential is it pretty much states that. All buildings that are not residential by definition are a commercial building. But to clarify it a little bit more, is there is multi-family.

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And multi-family is broken into low-rise and high-rise. So within the IECC you will see that high-rise multi-family would be showing compliance through the commercial. That is a structure or a building that is greater than three stories in height above grade plane. I'll get more into some of those provisions later on in the presentation. So also in the scope of chapter one and at the top I give you the section numbers that come right from 2015 energy code, we got to talk a little bit about mixed occupancy and compliance because when you're getting into existing buildings, typically they're mixed use.

A lot of them are mixed use. I get a lot of questions that come into the help desk. Well, how do you show compliance for a mixed-use occupancy? What the code says is that you have to treat each one separately. So if I have a two-story building and I have residential; I have a house on the top floor –

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-- and maybe I have an office on the first floor, I'm going to have to separate those two out and have two different compliance reports that I will be submitting. So you treat your commercial occupancy through the commercial code, your residential through the residential code. Now this gets a little tricky when you get into bigger buildings and bigger mixed occupancies. And I get a lot of questions on different variances or different

ways buildings are constructed and how do I show compliance. And there's just so many that I will try to give you examples as we go through this presentation today, and if you still have some that you have questions on again, make sure you send your questions in. You can send it in to the question page.

So chapter one again, construction documents. I'm not going through new construction, but I think it's important to understand what construction documents would be required to be submitted for down to the building department or your authority of having jurisdiction, and what's required. And what's in the code?

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This is actually in the code. So it will give you a checklist of items as I call it, a grocery list of what you would need to submit. Now this changes because with alterations and additions you're not going to be going through every one of these checklist items, but as you see that insulation materials and R-values, fenestration, U-factors and the solar heat gain. So the rate gains on your windows and your glass doors. Calculations on your windows and glass doors, mechanical equipment, the size, the type. That's if you are installing new equipment or you have an addition where you're putting in new equipment. Equipment systems and controls.

You get into duct work. If you're altering your duct system with an addition, if you're adding new duct to an existing duct system then you're going to have information that you'd have to be submitting. Air sealing details depending on what you're doing in that building and then on the right-hand side, the commercial, that list just gets much longer where you're going to get into lighting and you're going to get into day lighting and –

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-- other things that might apply depending on what you're doing with your building. Another thing with scope is inspections. So with existing buildings it's not so much treated as new construction, but there might be a couple of inspections that are going to have to take place for the project. And it pretty much is what construction work would be required where a permit would be required is actually subject to inspection. That doesn't mean that the code official would be doing the inspections, but it could be designated by a third party. But the code does say or does require that when it is, when construction work does require a permit that it is up for inspection.

So what's required in the inspections? And in the 2015 IECC they actually provided a lot more detail and broke out the different inspections that would take place. And so within the software we have kind of treated the inspection checklist the same way.

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So we did the same structure and flow in the actual reports that you're seeing here. So you would see a footing and foundation, a framing for the rough in, plumbing,

mechanical and then a final. And there's actually provisions that the code plan reviewer and inspector would go through and check off depending. So not all those will apply depending on what you're doing with your project, but it's important to know that each one of these or maybe all of them might be applicable to your project depending on what's going on.

So now let's get right into the chapter for existing buildings. And this will be chapter five and they are broken out into two separate chapters, but underneath those you'll see that the sections are pretty much identical. The information isn't identical, but some of it is and I'm going to go through some of that as well. So let's start off with residential and you'll see that there's a general section for scope. Then it goes into additions and then another section for alterations.

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There's a small section on repairs and then change of occupancy or use. So with general again, this is the same information that's in both chapters the residential and commercial. And what is the scope? What's the general scope? So we have additions, repairs, alterations, change of occupancy or relocation, existing building structures and then it has all these codes. So list the IRC which would be for a residential only, but what really is the intent on what it's saying here is that yes, you have the IECC that you need to comply to, but there may be several other provisions that would be applicable for the project as well. These acronyms are here for example. IFC is the international fuel code. Then you have the NFPA, which is the fire code. You have the plumbing code. You have the mechanical code. So if you're doing a project, you just need to be paying attention to that other codes may be applicable at the time you're doing your project --

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-- and those construction documents that you're submitting. So with additions, with alterations and additions if in an existing building anything that you're not touching, a condition-existing building doesn't mean it has to be brought up to code. That's really important and I probably will repeat that over and over again. So unaltered portions of that existing building or building supply systems shall not be required to comply with the code. And it depends.

So with that what else wouldn't have to be required? What's another exception? That would be historic buildings. And with historic buildings I've provided actually what it has in the code there because this also gets down into what the state has legally. They might have special requirements for historic buildings, but with historic buildings a lot of them are getting altered and they're doing alterations to them maybe on the interior --

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-- but most of the times what I see is that the façade that can't change. They can't change the glazing because those windows maybe are over 100 years old and they can't change

the look of them, for example a church, but they are doing some renovations on the interior. Well as long as they're registered and that registration, the historic preservation and the jurisdiction has that documentation, they should be exempt from having to meet full compliance to the energy code.

All right. In residential, existing buildings, let's talk about additions. So for additions, how can they comply? The addition comply by itself and meet the provisions in the code. And with that addition you treat it as new construction basically. But it's only for the assemblies, but building envelope of the addition. Or you can take the addition and you can add it to the existing building and it can comply as a single building. And you also can take the existing building and the addition –

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-- and combine it together as long as it doesn't use any more energy than what the existing building is. And you're like what? I don't get it. So the last bullet here is probably the most, I would say the most time consuming to figure out. And really what it's saying is if I have an addition that I'm going to add to an existing building and I'm willing to run some simulations to see where my compliance is, as long as I'm not increasing the overall energy uses of the overall existing building as it sits today, then I can comply that way. I don't typically see a lot of projects that way. They usually typically just try to show compliance to the addition alone because it's the quickest and fastest way to do it.

With additions, what the code has in chapter five is you can show compliance prescriptively. So there's a picture here that shows the addition off to the side. There are prescriptive requirements. There's a prescriptive table for insulation and fenestration.

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You can go to your climate zone, look at the minimum insulation and fenestration, make sure you're meeting it and you're done. And then you need to abide by all the rest of the requirements in the code. You can also take the existing addition and do the simulated performance alternative. This is where it gets into energy usage. This takes a little bit more time to do and takes a special software tool to do it. The prescriptive requirements sit in table R402.1.2 or 402.1.4. Those are two different tables. One's an R-value table, insulation and fenestration only, and one's a U-factor table or total UA. Very important. Keep this in mind. The software tools we use the U-factor table. That's the baseline for the assemblies that are in the software tools, which I'll show you.

Here is a screenshot of the insulation table. This is where I said use these materials as a resource when you're going back –

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-- and if you don't have a code book then definitely you're going to want this table if you're doing a project because these are the minimum insulation and fenestration requirements broken down by climate zone. And this is for the 2015 IECC. That might not apply in your region, but this is the most recent code that has been published at this time so that's the one I'll be talking about today. So here they are. You might want to go back and reference this and we will look at these in the tool because these minimum values are in there as U-factors. And I'll go into that in more detail as well.

All right. With additions there's more. So I've talked about the building envelope and I showed you the prescriptive table, but what if you're changing your heating and cooling system? Then there are some provisions. What if you're putting in a new HVAC system or a new duct system with the addition or in the addition by itself? Let's say it's an addition. It's a very big addition and it's going to have its own mechanical system or it will be zoned separately. Then there are some provisions that you're going to need to make sure that you meet. There are some exceptions

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-- and it's for duct work. There is no duct work or duct design that you would enter in either software tools, REScheck or COMcheck. It's actually a checklist item and so is duct insulation and duct sealing and duct testing, but this exception is if you are less than 40 linear feet of unconditioned space that you are adding to then it's not required to be tested. Still has to be insulated. Still has to be sealed, but the biggie is that 40 linear feet is the threshold that you wouldn't have to retest the duct system.

Service water heating. You're putting in a new service water heating systems then that must comply as a new system. Lighting. The one exception for lighting for residential is if it is not less than 75 percent of the lamps permanently installed lighting fixtures. So really is 75 percent is the threshold for an addition that has to meet high efficacy lighting actually.

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So if I'm doing an addition and I have permanently installed fixtures you're going to have to total those up and 75 percent of those permanently installed fixtures need to be high efficacy. What is high efficacy? Compact fluorescent LEDs. All right. That was additions and we will do some takeoffs in REScheck and I'll show you how that works, but now let's talk about alterations.

This alterations are when you are touching that building thermal envelope then it's fair game that it needs to meet code. If you are not touching it then it does not need to comply. So unaltered portions – if you're not touching it then you don't need to show it. For new construction you're showing takeoffs for an entire building but not for alterations. So if I'm doing window replacement and that's it, that's all I'm doing on my building then that's all I'm showing and that's all I'm submitting to the building

department. And also my backup of my construction specifications on the ratings on those windows.

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So replacement fenestration down below shows the section from the code and then it's just providing you what the requirements are. I didn't list the U-factors because you can go to the prescriptive table. But the U-factors do apply in all climate zones and then the solar heat gain coefficient which is another rating on fenestration, but it's specific to specific climate zones, 1-3, and then climate zone 4.

All right. So those exceptions that I talked about for alterations. For the building envelope – and these are imbedded in the software for REScheck and COMcheck. So I will quickly go through them because we're going to look at them again. When can I have an exception based on what I'm doing with my project? Storms windows over an existing fenestration, exempt. When you're putting a surface applied window film on an existing single pane, which really works toward that solar gain on the building, that's really the intent of those, is that's exempt.

Also if I'm –

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-- exposing the existing ceiling, wall, floor cavities, if I'm exposing them during an alteration as long as I'm filling those cavities completely full with insulation, exempt. Where the existing roof, wall, floor cavity isn't exposed – so if I'm just doing a roof replacement on the top membrane of the roof, maybe just the shingles and I don't go down to expose the insulation I'm exempt from having to meet the energy provisions for putting more insulation in that ceiling or up, you know, upgrading and putting insulation in the ceiling for that matter. So roof recovery is another one. And then there is another one for roof provisions as well that you can see that depends on whether you're exposing the sheeting or not.

Lighting. Exception for lighting – now this is an alteration. So you have an existing building and it's residential so if you're replacing less than 50 percent of the luminaires in a space. So let's say I'm doing a kitchen renovation and I'm replacing all the lighting –

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-- then you need to comply to the code. It's based on the permanent fixtures within each space. So more alteration exceptions. We get into heating and cooling. I talked about this a little bit. So with an HVAC system and duct system that are part of an alteration must comply and I've given you the section numbers. And those are in chapter 4, but there is an exception here and it has to do with the duct systems and it's that linear feet again that was in the one for additions. It's the same provision. Service water heating, if

that's part of the alteration then it must comply to R403.4. And now let's get into change and space conditioning.

There's change in space conditioning and then there's change in occupancy. Two separate ones. So change in space conditioning means if you have any non-condition or low-energy space –

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-- that is to be altered and become conditioned space then it has to be brought up into full compliance. What does that mean? Let's say I have a garage and I'm going to take the garage and I want to make it a family room. That's typical. That happens quite a bit. That's an unconditioned space that now I'm bringing up to conditioned space. So that would be considered an alteration.

Now there's interpretations that you can look at these because with additions, additions can be you're adding new condition floor area. And let's say that garage that you're turning into a family room is it an alteration or an addition? So pay attention to what your project is doing and what's happening and what provision really it falls under whether it's an addition or an alteration. And then there's an exception here that talks about the simulated performance and the exception there when it gets into the annual energy usage and what would apply.

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So repairs. I wanted to have this in there that you could go to it if need be that you were doing only repairs in a building. This isn't something that you can show in the software tools, but it is part of this chapter. And really, you know, repairs are pretty basic. They've listed a couple. These are the only ones they show that are part of the code, so glass only replacement, roof repairs, repairs to lighting. But there are other ones that are maintenance and so forth and it's a small section in the code, but you might have to refer to it if someone – let's say there's a building official that's saying no, that's not a repair. I don't consider that a repair. That's considered an alteration. Well then you might need to go to the code book and look and see that you are on the right path whether you can show it as an exception as a repair or it really, truly is something that has to meet full compliance.

Here's that change of occupancy or use that I talked about. Now this is in both residential and commercial.

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A little bit different language, but similar. So change of occupancy. What does that mean? Spaces undergoing a change of occupancy that would result in increased demand of energy or fossil fuel, electric energy. So I'm converting a dwelling unit or I have an office. You know, I have an old building. Let's say it's an old office building and it's

going to be converted into a multi-family structure. Well, that's a change of occupancy. There are exceptions. If you can show based on the simulated performance and you're showing at 110 percent of the annual energy cost – I don't see a lot of that being done. Basically when there's a change of occupancy and you're doing a full retrofit they're meeting code. They're just going through the provisions and they're going through full compliance. And sometimes they do full performance based and they're doing an energy cost, but typically they start off going through the prescriptive path to show compliance first.

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So with that you have change of occupancy and you have change of space conditioning. Two different terms in the code.

All right so let's go into commercial. Again, this shows you the same provisions that I showed you for residential about alterations. Unaltered portions don't need to comply. And then the historic provision which is the exact same wording in the residential chapter that it is in the commercial chapter. So commercial. Let's talk about additions. There's something new with commercial that's not in the residential. Now we have a direct reference to ASHRAE.

So if I have the commercial building – and this applies to additions and alterations -- I can choose to go to the ASHRAE standard. And this one is ASHRAE 90.1-2013. I don't need to comply with the commercial sections in the IECC if I choose to use ASHRAE. However, you can't mix and match the codes.

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I can't use ASHRAE for my building envelope and then go use the IECC for my lighting. It's one or the other, and it's either the standard you're using for the full project or you're using the IECC. So let's see some examples. If I'm converting an unconditioned warehouse to an office space well, that's one. Let's say I'm taking an old factory building and I'm going to convert that into condominiums or apartments. That's another one. That needs to meet full compliance and it could be considered an addition. Or it's a shell building buildout. This is most popular these retail strip malls that are going to get ready to be leased and the lessee is the one that's responsible to bring that space up to code. It gets really tedious if they have to bring the building envelope up to code. Typically it's just the lighting and any electrical, but if they do and there's a change of occupancy, this is where if that retail space –

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-- when it was built was under one occupancy use and now it's going to change because now I'm going to go in and lease that space and it's going to be office space or let's say it's a medical, then that changes the entire game. So you really need to know when you're

getting into leasing a space what the original space was permitted for if you have a change of space conditioning and change of occupancy.

A screen shot. I'm not going to get into 90.1-2013 too much, but I do have some slides that show the provisions, the requirements for alterations and additions. But as you see, here's the structure in 90.1. There is not a separate chapter for existing building. So if you are using 90.1 you would literally have to go in to each one of those sections that is applicable to your project and find where the alterations and the additions are in those chapters and what's applicable to your project to make sure you're meeting those requirements.

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So with additions, we're still back over – this is section C502 in the IECC. There are some provisions for additions. Now I'm on additions. Vertical fenestration – there are some thresholds. And the threshold for window to wall ratio is 30 percent. So if I have a building or an addition say the total addition or the additional load is really where it is that has greater than 30 percent fenestration, window to wall ratio, I'm going to have to go full performance base, total building performance unless – there is a provision in here that I can use if I use daylight responsive controls for the addition, I can bump that up to 40 percent. I'll show that to you in the software. So keep in mind 30-40 percent. Those are your thresholds for using the software tools. If you are over 40 percent using daylight responsive controls –

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-- and your window to wall ration is higher than that, then you have to show compliance based on the total building performance C407. That's using a different software tool. That's full energy cost-budget method approach. That's doing energy analysis. That is not what COMcheck is set up to do for commercial buildings.

Skylights. I talked about vertical fenestration has some limits that you need to be aware of. Skylights the same thing. Now we're talking additions, but this also is applicable to alterations as well. So with that, skylight area, roof to skylight area less than 3 percent then you can use COMcheck. What if I'm over 3 percent? Same as the vertical fenestration up above. I can go up to 5 percent if I'm using daylight responsive controls. That's it though. That's my threshold. If I'm over 5 percent, and this can be for the addition –

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-- or the entire building, I need to go total building performance. What else is in there for existing buildings and additions? Well, we have mechanical. So mechanical systems must comply with section C403. I won't get into that but that's a reference for you to go to if that's applicable to you. Service water heating is the next section which is C404. We have pools, in-ground, permanently installed spas. Pools and spas is a check list item

in COMcheck. It's nothing that you can actually go and input some values and run some takeoffs. Service water heating same thing. You would be putting in your service water heating system and efficiency capacity. That's it.

Lighting. Lighting power and systems. So with lighting if you have an addition well it's fair game. Interior lighting needs to comply and you can comply with the addition by itself or the addition and the rest of the building, the existing building or –

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-- and keep in mind exterior also needs to comply. So if you have exterior lighting on that addition that's new, then that needs to comply as well. Now I touched on additions and now we're jumping over to alterations. And there are some provisions that are the same that I just mentioned. So the code applies to any new construction. Unaltered portions which I've said several times does not need to meet code. So if you're not touching it don't show it. We also have the direct reference to ASHRAE again. So you wouldn't have to use the IECC. But again, you can't mix and match.

Vertical fenestration and that skylight area that I showed you previously is similar for alterations. You got those threshold limits. Same thing. What are the exceptions for commercial buildings for alterations? These exceptions are listed and you can choose them in COMcheck similarly to the residential –

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-- that I showed you the exceptions for that are storm windows over existing fenestration, the surface applied window film that I talked about. Exposing the cavity. This is in the building thermal envelope. So if I'm exposing the ceiling cavity, the exterior walls, the exterior floor of the building thermal envelope, as long as it's filled with insulation I'm okay. You still should submit your report because you are altering the building thermal envelope except you might not have to bring it all the way up to the provisions that are in the prescriptive tables because you've met this exception.

All right. So where existing roof, floor, wall cavity isn't exposed what does that mean? I'm exempt. Does that mean I have to submit something to the building department? You should. You're telling them that you are doing some alterations to a building; however, I'm exempt from having to meet the provisions for putting more insulation in those assemblies for the building thermal envelope. Roof recover, there's an air barrier –

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-- exception for the roof replacement. Now let's get to lighting. Lighting alterations. It's less than 10 percent of in the space, you're exempt. All right. There's some ambiguity in the code here. In chapter 5 of the 2015 you'll see two numbers for lighting. There's in the scope for the lighting it shows 50 percent. And then the actual lighting section, which I provided to you here, C503.6, it says 10 percent. With that said, the intent when the

2015 IECC came out basically it should have been 10 percent. It's not. That 50 percent is in there as well. In ASHRAE 90.1-2013, the threshold is 20 percent. COMcheck the threshold is 10 percent. So I just want to point that out that that is the value that is used. If you're over 10 percent then the whole lighting of that space needs to be brought up to code.

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All right. So we got into change in space conditioning. As I mentioned in the residential similarly to the commercial any non-condition or low-energy spaces being altered to become a conditioned space needs to be brought up to code, period. So low-energy use – what is a low-energy use? The code does have a definition for a low-energy use building and that's when it would not have to meet the provisions for the building envelope. Let's say you have new construction but you have a low-energy building. It's 3.4 BTUs per square foot for condition floor area; 3.4 is the value to keep in mind, BTUs per hour per square foot.

Alterations. We have more because I talked about the building envelope so now let's go into the other ones. So if you're altering the HVAC system, the duct system there are some provisions there.

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Economizers might come into play depending on your climate zone, depending on the capacity of the system that you are altering, economizers might kick in. Service water heating, same thing. If you are putting in new service water heating as part of the alteration then it's fair game. It needs to comply. Lighting systems -- and this is where that C503.6 is for the specific requirements for lighting – is that exception for that threshold of 10 percent. Then it would be exempt. Ten percent isn't very much so basically when you're altering a space, typically they're showing compliance for the entire space.

Okay. Repairs. I don't want to touch on this too much. Again, this is the same thing as residential. Repairs is something that you're fixing, something that may be damaged. There are some other provisions, additional provisions here for commercial buildings, but again the software does not address repairs, but it's good to have this information so you're aware of well does it fall under repair or does it fall under an alteration.

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So you can reference this later and go back. Change in occupancy. I talked about change in space conditioning. Now we got change in occupancy. So with commercial it's a little different. So space is undergoing a change in occupancy that would result in increased energy must comply. What does that mean? In the commercial chapters there's two tables. There's a building area for the entire building and then there's a space-by-space. And it gives you lighting wattages. The LPD, lighting power density is what that stands

for. And basically if I'm going to change, if a building is going through a change in space conditioning and it's an old building, I highly doubt that it's not going to – you're going to meet this thing of the energy has to be less than – how do I say it?

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The existing lighting – and I'm changing my space type. Let's say it's retail and I'm going to change it to an office, you have to look at the lighting power density of what the office is and what's existing. And if it's not less than the full – it needs to go into compliance. And what I'm trying to get at is nine times out of ten you're having to comply. The lighting power density in the codes have really tightened down through the years of the versions of the code and 90.1. So it would be pretty difficult to see that if you had a change in occupancy that you would be exempt from the lighting especially if it's an old building. Any questions on that we can go into more detail later.

So alterations exceptions. This is from 90.1. They are a little bit different than the IECC. So you have storm windows. You have if you're just replacing the glazing, insulation. If you're –

[0:39:00]

-- filling the cavity, but here it's a little bit different. It's R3 per inch depending on roof covering and all these sort of things. All these are also in the software. Lighting alterations. This is 90.1. I jumped to 90.1 just so you have this as a reference if you're using 90.1 instead of IECC that that threshold limit is the same. That 10 percent of connected lighting load is almost that if your alteration is less than 10 percent then you don't need to comply. But if it's over then you need to go in full compliance and show the entire space and all fixtures.

There is HVAC so you have new equipment meaning minimum efficiency requirements, cooling systems, same thing, alterations to existing cooling systems. There are some provisions there for economizers. Duct work. Now duct work, you'll want to take a look at this if you're new or if you are replacing duct work that there are provisions that it must comply.

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Piping, service water heating piping. If you're replacing the piping then you need to look at the provisions because you probably need to insulate that piping. So there are some exceptions in 90.1, and this gives you the little laundry list of the exceptions for mechanical systems. I won't touch on these too much. One example is refrigerant changing in existing equipment. That's exempt. Relocation of existing equipment doesn't mean you need to bring it up into full compliance and bring a new system in. All you're doing is moving it; it's exempt.

Okay. That was really quick and I have a lot to cover today. So now what I'm going to do is get into the tools and I think that's the most important part that everyone's wanting to see today is how do you run your buildings and show compliance for an addition alteration? I'm going to show you REScheck first. So I need to jump over to that tool.

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Give it a minute to make sure it's up on the screen. All right. So I'm on a desktop. There's a web tool and there's a desktop tool. So I'm showing you the desktop and I have the code that's already chosen on 2015. Now there is a video that's out there on Energycodes.gov, under training that's RESchecks basics. I'm not going to go through the basics and the functionality of REScheck today. I'm going to only cover – well let's run some takeoffs for an addition and let me show you how alterations works because it is a little different than new construction. And it is different from showing compliance for an addition.

So with that said, I'm not going to show you every feature and function of REScheck. If you want to know those and you're new to the tool, I highly suggest you go out and it's me again. I'm on the video for the REScheck basics. You can go listen to that video and get the –

[0:42:00]

-- 101 on REScheck. So but importantly to know what code you're on and I'm showing you 2015 and there's some state specific codes in here as well. So four tabs at the top. Project -- very important. You go to know where your location is. I just happened to choose Amarillo, Texas -- maybe I like the song; I don't know -- for our tech type. Nope, it's not new construction. Let's choose addition. And some things we'll change in the back end, but not much because additions really is those new assemblings of the building. Envelope for the addition, have to meet code as though it's new construction. However, the software already makes an assumption when you choose that that it already knows you don't have a complete building thermal envelope. Really important to remember that.

Building characteristics. I need to define whether this is one and two family or multi-family, low rise, multi-family, not high rise. If it's over three stories that's commercial. You'll be using COMcheck.

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And then some other checklist items that you would want to go through, ducts and condition space, pools, so forth. We won't go into those. Project details where you can enter your applicable information for your project. So we have other tabs here and I'm talking about additions right now so I have envelope, mechanical and requirement tabs at the top. Where am I going to spend most of my time is in the envelope section. I want to have those building plans in front of me, maybe the code book or maybe the presentation

that I have given you today which has the reference section numbers and the exceptions. However, to make it real easy for users, we've imbedded all of that right into REScheck similar to COMcheck. But you need the building plans because you need to know what assemblies that you need to run to run your takeoffs for the addition.

So let's just say I have a single story. Let's just single-story house and I'm going to add a bonus room to the south side of the building. I'm not adding above –

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-- existing on single story. What am I going to have? I'm going to have a new roof, a new ceiling. I'm probably going to have three new existing exterior walls and I might have a new floor. And I'm going to have some new windows. I don't know if I'll have an exterior door to the outside. If I don't I won't have a door because an interior door to the existing part of the house would not need to comply. So let's run this.

All right, ceiling. So I have a ceiling and you can choose from the dropdown list of assembly choices that are here, and each one of these already has a calculated U-factor. What that means is we've done all the leg work and used ASHRAE Fundamentals for the typical components that would be involved in that construction type and calculated up what the U-Factor would be, meaning the air films, the framing factor, framing percentage and if there's chip board. Whatever is involved, siding, what it might be we ran the calculation. But what we don't know is what the insulation value is.

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So let's just put one in. So flat ceiling. What's the square footage of my new addition? Let's just say it's 500 square feet. And for a ceiling I'm going to say oh, I'm insulating it to R-38. What I haven't done here is I'm not breaking my ceiling insulation apart. This happens quite a bit. So questions come in as – and I've seen several reports this way – is no, I have so much insulation above my trusses. That's continuous insulation. Yeah, it is, but the software already runs that calculation. If you are blowing in R-38, if you're laying in R-38 one application it's cavity. The R value is what determines the amount of inches above those trusses that the software will run another calculation in the back end for that overall U-Factor. Now, if you were to put continuous insulation in here for the ceiling that's assuming –

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-- full height, full credit and it typically is foam board. And you're typically not doing that unless it's at the roof deck and you have a conditioned attic. So let's keep going. Walls. I have those three exterior walls. If they're all the same type of assembly construction, I can total them all up, one line item. So let's just put in 16 inch on center. I'm totaling up all my exterior walls. This is the opaque area. Let's say I have 1200 square feet that includes the windows and doors that are in those walls. My insulation

value – and it recalculated U-Factor. So you'll see the U-factor column there and it shows .06. All right.

Let's go down to windows. Same thing. I'm entering my windows. I'm going to my window specs and I'm entering the rough opening of my windows. And if you do not have an NFRC-labeled product –

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-- well, the code says you got to use the default values. And I will tell you the default values, there is a table and they are imbedded in REScheck and COMcheck, but the worst case scenario – and they don't meet the prescriptive values. So really you're almost forced to have NFRC rated, tested, labeled products and use those ratings for your windows to meet compliance especially for alterations. You won't meet it. You won't meet compliance. And so let's just put in an arbitrary .30 and a solar heat gain of a .40.

All right. Basements. Again, you can go to the REScheck basics and see how to run takeoffs for some of these assemblies, but I'm doing an addition. My, you know, make believe addition was on the side of the house, right? Well, let's say you have a basement that was when the house was built that it was unconditioned and now it's going to be conditioned. It's being finished out. Well if I was just doing a finish out of a basement and I'll show that to you under alterations –

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-- then you would be using the basement button and defining your basement that way. I don't have a basement for this one so I'm going to delete that. I'll get back to that. So where's my floor? I have, I've entered my windows and keep in mind I've got my building plans in front of me so I need that building thermal envelope of the addition, right. So what's my floor assembly? Do I have a slab on grade? Do I have a floor over a vented crawl space? What is my floor? Well crawls – you would only show a crawl wall if the crawl space is conditioned. If it's not conditioned and it's vented to the outside then you don't show it because it doesn't need to be insulated if it's vented to the outside. So it would be the floor above the crawl.

Let's just say though I am in Texas. And Texas they typically do slab on grade. So with slab on grade it could be unheated or heated. What that means is heated is if I have a hydronic system in my slab. Not typical in Texas.

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So it's going to be unheated more than likely. And it brings up this nice, pretty picture of how are you insulating your slab. COMcheck does the same thing. And in some areas, most areas of Texas, climates zones 1-3 there really isn't insulation requirements, but in this climate zone 4 there is. So I need to determine what my depth of insulation would be and it goes up to a minimum distance by the way. So I can go one, two, four, six feet.

And let's just assume that I'm going to insulate four feet. So I'm doing the slab edge vertical insulation or vertical plus horizontal. And then I click okay, and now I got to put the ridge of foam board R value in which I'm just going to assume is just R10. And I'm done.

Now down at the bottom, down at the very bottom, this is a fast, quick addition that I've entered in here. Wow, you guys I guess I got to put the slab footage in, right? This is the only assembly and this is the same in COMcheck --

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-- that you would enter in linear feet, the only assembly. I see it quite a bit in projects where there have entered the total square footage for that slab on grade and their project's failing by 200-plus percent especially on commercial buildings. Linear feet you're adding up the linear feet. Go around the building only of the addition and adding up that linear feet of the slab. So this one it's going to be small. Fifty feet. I'm just assuming. It's an arbitrary number. So it wouldn't be 500. It wouldn't be the total square footage. It's not going to be the entire floor area. It's the linear feet of the exposed edge of the slab.

So I've done that and now I have this project and it actually has a little teaser and says make sure you've entered it in linear feet. And I hit okay. So down at the very bottom -- and both tools do the same thing. It will tell you compliance passes or fails --

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-- max UA, that's your UA, the U-factor times the area, and look. I'm passing. And my make believe addition meets code. So it says 4.6 better than code. I'm done. I can save this project date of file under file menu. I can go view, print the report. I can email the report right to the building department if I wanted to. Done with my addition. However, I'm not completely done. There's this requirements tab that sits over here. Or if I have a mechanical system in this addition I would maybe want to enter my mechanical system, but there really is no pass or fail for mechanical systems in REScheck. There's no pass and fail in COMcheck. You are entering your minimum efficiency and capacity systems. They have to meet federal standards anyway. So basically you can enter it and show it as part of your project. There is no calculations towards your building envelope for mechanical systems whatsoever.

Requirements. You do need to go through the requirements. And you need to confirm --

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-- that you're meeting these provisions because these are the mandatory or other provisions that are part of the code that still apply. You're going to have air ceiling. You need to make sure that you've sealed up those walls. You need to make sure you've sealed around those windows. You have, you might have an air leakage test that you're going to have to do. You need to go through these and determine whether requirements will be

met, not applicable and you can even put where they are on the plans. So you go through, click on each one of these, come over to the right. Requirements will be met. Maybe put where it is on the plans and you'll see it turns green. You go through each one of these provisions. Might not be applicable; it might be, but this gives you the rest of what's in that code. COMcheck is set up the same way.

All right. Let's go over to alterations. I'm going to hit new here. I don't want to save this. And now I'm going to click on alterations. Alterations is its own tool really

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-- within both REScheck and COMcheck. It is prescriptive. And what does that mean? It can't do tradeoffs. Each individual assembly that you touch in that building that's part of the building thermal envelope and even lighting for commercial is prescriptive. You're not trading against anything. Each one has to meet code on its own or you fail. So understanding that part is important because you might have one item, one assembly that's failing and it will show that the whole project fails, but the rest of your stuff is great. So pay attention to if you have a project that has lots of alterations going on that you're putting in and showing, but it's showing fail. You're going to have to go through and make sure there are no tradeoffs.

All right. So again I go over and I'm going to define my building characteristics whether it's one to two family or it's multi-family, rest of it similar. Project details and I come over to envelope.

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Now this is where things change, and when I show you COMcheck I'm going to show you different details of COMcheck but they are structured the same way. So what we've got for alterations? Let's just make something up. So let's look at ceilings and I'm going to say that we're doing, we're going to put a new roof on. And let's just say that it's a flat ceiling. It could be a raised heel energy truss. It could be a steel joist and it could be an assembly that's not even listed in here.

If you have an assembly that is not one of the drop-down choices each one of these in both software tools gives you the option to choose other. However, keep in mind other has to be tied to a baseline in the code or how else would we say that it passes or doesn't pass? And that is tied to the prescriptive table because there is attics and other for example in the prescriptive table and that's what that baseline would go to. I could spend more time on that –

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-- but I'm not going to today. More of a code driven going into the specifications of that, but if you have maybe that's something that you need more information on then let me know. So let's put flat ceiling in. Now what happens? Each time you put in an assembly

that you're altering, it's going to give you a pop up window. I'm not going to go through all of these. I gave you what the code requirements are in the slides I went through. These are imbedded in both software tools and these are all those exemptions. And they're different for each assembly type. So for a roof if I'm not exposing the framing cavity then exempt. If I'm completely filling the cavity, exempt. However, the important thing is if none of those comply, none of those are applicable to what I'm doing for that roof, then I would choose no exemptions apply to this assembly. COMcheck gets a little bit more detailed and it will actually show you what you have to meet, which is kind of nice. This one does too, but I'm going to hit no exemptions apply.

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And I hit okay. Now, what's nice is I come up and I go okay; I got to comply. What do I do? What if I don't have the code book and I don't even know what I'm posted to insulate the ceiling to? Well, you can go to that table that I put in the presentation or you could play around with the software a little bit because it gives you what the maximum U-Factor is here. So the column over here that says maximum U-Factor, this is what you have to meet individually. I can't trade it off against anything. I'm going to put the square footage of my ceiling. And then, well typical insulation in a ceiling is, you know, common is R38 or R39, right or R30.

So this proposed U-Factor will change because I had mentioned to you before, each one of those assemblies that are in these software tools already has a calculated U-Factor for the typical components of that assembly. But I don't know what you're insulating it to. Until you give me that R value I can't change it. So once I put the R value in –

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-- and let's just put R30, and then I tab over, then I'm recalculating that proposed U-Factor. However, R30 doesn't meet code here. Look down at the very bottom. Compliance fails. That's all you're going to get for alterations and even in COMcheck you're not going to get a percentage. It's either going to fail or it's going to pass. So each one of these provisions as you go through make sure it's passing before you move to the next alteration. So with that I'm either going to have to add continuous ridge of foam board to this ceiling or I'm going to have to beef up my insulation levels to meet code. I'll put in R38 and look. Now, I'm still not meeting code because I'm still just barely under or over that maximum U-Factor. So I'll put R49 in my ceiling and now I'm meeting code. Done.

So if I'm altering something else – let's go to one more thing because I'll show you walls real quick. So let's just take typical wood framed wall. See how the alterations come up that come from code?

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Well let's say that I'm meeting one of those. I'm going to choose that all right, it's exposed but I'm filling the entire cavity. I'm going to fill it. I click okay. You still want to show it as part of your project. You still want to give that to the code official because if it's being altered and the inspector comes out on site and he goes wait a minute. Wait a minute. Where is this on the report? You want to make sure that you're showing it and you're showing that you have an exception to it because you completely filled the cavity. So whatever you're touching it's very important. Whatever you're touching, show if it's part of the building thermal envelope.

If you have an interior wall that's between two condition spaces I don't care about that. The code doesn't care about that. You're not showing that only that building thermal envelope. Lighting, mechanical, service, water heating – those are the things that are important, the things that I showed you in the presentation. All right. Look down below. So I had an exception here. Now I'm still passing. I'm not failing. So let's go put a window in. I'm not going to put all these assemblies in. You can go play with this later.

[0:59:00]

Just giving you a feel for how this works, but windows is a little bit different and skylights are a little bit different for these tools. So let's say I got a wood frame, double pane, low e. And there's those exceptions again and so I'm going to say I don't have any exceptions, but if I did I'd choose it and then I'd go on my merry way. But there's other things that happen with no exceptions. So I hit it. Now I'm going to put in the rough opening of the windows I'm replacing. So you have a pre and a post-alteration. This is post-alteration.

What am I putting in the building? So take the rough opening. I'm adding it up. Let's say it's 100 square feet. And where am I getting my U-Factor on my solar heat gain? I'll tell you when I mentioned the default values they will not pass. They will not meet the prescriptive values. But let's say you wanted to use them. I'm putting my cursor in that proposed U-Factor. If I right click –

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-- with my mouse, I can select the default and it will bring up the same table that's in the 2015 and you can choose it. Look at those values. Those are worst case scenario. They will not work, not when you have to show compliance individually for an alteration. Those are not going to help you. But they're there and if you wanted to see them you could try them. But they ain't going to work. Please select a value. I'm going to hit cancel.

All right. So I'm going to go put in a nice value that I know will work, hopefully. All right. And then solar heat gain. What is this average thing over off to the right? Well in the code you can do area-weighted average, but the area-weighted average means that you're going to that prescriptive table, the U-Factor table, and that area-weighted average is .35 for the U-Factor. I could have maybe two windows with a U-Factor that's higher

than that and it's the area, the square footage of that window and then maybe ones that are lower than that.

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So let's put in a 30 which is better, right. So if I put in another window here, no exemptions apply and I hit okay. And let's put in another 100 square feet here, and let's say that now I'm way over the 35. I have windows that don't meet the minimum prescriptive U-Factor value so I'll put in 37 and I'll put in the same solar heat gain. As long as the area-weighted average meets that minimum U-Factor that's in the prescriptive table I'm still okay. Very important area-weighted average.

COMcheck does the same thing, but there are some other stipulations and other requirements in the commercial code that come into play. We'll look at those in a minute. My compliance passes. I will tell you though if I was to put in a .50 window here look down below. I am failing.

[1:02:00]

-- I'm failing. So we don't want to do that. We'll put it back down to a 3.3 and it will meet. Well, as long as I put the remember in there correctly, right. So put a 3.0 and now I'm passing. Okay. Again, you can go in and put your floor in. If you have a crawl that you're altering as a condition crawl don't see that a lot typically unless they're taking a crawl and they're converting it into condition space. I do see that. Then you'd have to show it. But that's really the gist of the alterations. Again, I'm missing something. I've gone through and double checked my provisions here. You want to do that, make sure that every alteration you do for that project you're showing it here and then it shows passing down at the bottom. It won't be a compliance rate. It's going to be a pass or a fail.

If it says fail you're going to have to go back and find it where it is, which assembly is failing. And the thing to look for, there are color keys in the tools. Red means bad. Red means it's missing information, missing data.

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So if you see something in red like look, I'll remove that U-Factor and let me – it's showing it in red. I need that. Now it's saying down at the very bottom it gives you little teasers. So invalid or incomplete envelope data. Go back and look. What's in red? Find it and it's not too easy when you have 50 or 60 assemblies in there. So carefully go back and when you're entering your information, you know, go through and double check each one or after you're done look at your building plans. Double check your entries, your square footages, your ratings. Make sure it's all good before you submit it down to the building department so you don't have to resubmit something again. And it saves everyone time.

All right. Let's go look at the requirements. I showed you this for additions. Well the same applies for alterations. You want to go through these requirements and say whether they're going to be met or not. And a lot of these will be not applicable I would say because alterations are very specific to whatever you're touching.

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So you know, this will be so quick to go through, yet it makes it for a nice, complete report. And it also is very efficient for that code official and building inspector because you're helping them by showing them what provisions still that you know you need to comply to or which ones are not applicable. And it helps them speed up plan review, helps your building get passed and get your permit and be on full occupancy of what you're doing for your project.

Okay. I'm going to move away from REScheck and we're going to go take a look at COMcheck because there's a lot more involved in COMcheck than there is REScheck. So I'll minimize that. Here's the two screenshots. Here's where you can go get REScheck and there's a screenshot of REScheck web. And then there's the COMcheck. And COMcheck same thing. We have a web tool and a desktop tool. I'm going to show you the desktop tool.

[1:05:00]

Okay. I'll give it a second so you can see the entire thing. All right. So let's jump back to additions and with additions – so some of the same functions. It even kind of looks the same, doesn't it, as REScheck. But there's a lot more involved with COMcheck. And I have a lot to cover, and I know I'm talking fast. Please bug me later. Send me an email if you have questions, but I do have a lot to cover but I want to make sure I get a lot of this in so you can see all the, you know, the basics of alterations and additions in these tools. All right.

So same applies. I got this file menu at the top. First thing I want to make sure is that I got the applicable code on. And in here where I talked about standard 90.1, that you could use that, notice that that's a choice in here. But we're going to keep it on 2015 for right now. I don't think I'll have time to even look at 90.1-2013, but you can play around with that later if you wanted to.

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But you can't mix and match. And I highly suggest you don't enter an entire project using 2015 and then switch codes because there are different provisions. There's different assembly types. Things will change and you're having to fix things. So if you're going to start a project don't start switching in between the codes. That's just my recommendation because it's going to cause you more work and more time is all. Determine how you want to show compliance before you start entering it into these tools. Yet determine where you have an addition, whether you have an alteration. Determine all those things.

Have your building plans in front of you or whatever it might be, your mechanical specifications in front of you the time before you start putting them into these softwares and it's just going to save you a lot of time. All right. So we have more tabs we're dealing with. Let's look at the project tab. With the project tab I have some subtabs and then I've already chose Texas again. I don't know. I did that, but all to save us some time.

[1:07:00]

All right. So it's in climate zone 4-B and what does this mean for an addition? Again we have to have a baseline and additions – I can do tradeoffs for additions, but I can't for alterations. So software knows it's not a complete building envelope. So let's start playing with it. All right. We have to change it over to addition. And it gives you a little teaser. Hey, hey, you know, use this envelope, lighting. What's applying here? I can put in my project details and let's go over to these three tabs. I got building envelope area tab. I've got an interior and an exterior.

Just because I'm doing the envelope doesn't mean I have to do the lighting. I get that asked a lot. It could be the lighting designer that's doing your lighting for the project. When it comes to commercial buildings the web tool really makes it nice because if you guys all have the same log in one could be doing the lighting. The other could be doing the envelope. They're compiling one compliance report and that's what the building official likes to see anyway.

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Not several reports, one that has all of the provisions. They can do it in one project file. Or they can share that project file. But they are different compliance results for each one. They don't tie to each other. I can't do tradeoffs from my building envelope to my lighting. It's not a full performance based tool. So let's take a look at the building envelope. The building types come from the code. This is the table in the code and I need to choose one that matches my project or one that is closest to my project. There is not every building type, you know, under the sun in the codes, but these are the ones that are most common. So let's just say I have a retail space that I'm doing and I'm on additions right now so I have to define that addition, that new conditioned area of the addition.

So what's the floor area? Let's just say it's –

[1:09:00]

-- 1,000 square feet. There's a watts per square foot here. now there's space conditioning. Space conditioning is tied to that table based upon the climate zone and of course retail is not going to be residential. That would be multi-family, but you need to be sure that you choose the proper one because that sets it up for where it's going to look

up the baseline for the minimum U-Factor and ratings for the assemblies that you're putting in. Right? So non-residential.

Now if I'm doing lighting I would come over to the interior lighting tab and I would be entering that information, my lighting areas and my exterior lighting. But let's just look at building envelope for now. All right. I can add another one. Let's say I have more. I got two space types in my addition. So let's put in an office and let's put 1,200 square feet here. All right. Again, that's non-residential. Why I'm saying that is because it's important when you come over to the envelop that you are tying –

[1:10:00]

-- your building type to what you put in over in the project tab. So with an addition it's straight forward. First define where the addition is at. Now with commercial buildings this could be I'm adding onto the second story. I'm doing something in the basement. I didn't show you basement in REScheck by the way, but it's pretty straight forward on figuring that out if you're doing an unfinished basement and then you're going to convert it into conditioned space. Then you would put your basement walls in there.

However, with a basement if that floor is greater than 12 inches below grade, you wouldn't show the floor, and the software knows that. It assumes you wouldn't be insulating a slab on grade that's 12 inches below grade. But I forgot to mention that for you. So there's basement in COMcheck as well. The definition for basement is different. Fifty percent is the threshold for residential and 85 percent below grade means it's a basement wall for commercial. So back to this addition, I'm defining where that new –

[1:11:00]

-- thermal building envelope is for the addition. I might not have a roof. I might have a floor instead of a roof. So you know, typically you're missing one of these major assemblies for the building thermal envelope for an addition. Sometimes you're not. It could be a full structure because maybe it's thermally isolated, the addition is. But let's just put some values in here. I'll just do an added roof with joist. Again, see how it showed it in red? Anything that's in red means it's missing information and it's not going to calculate the rest of compliance without it. So look for stuff in red. It's very important.

Those two building types I've put in the project tab will show up here. You've got to define those over here. There's meaning to why those are there. There's internal loads that it looks at for those space types or those building types. COMcheck is a little more sophisticated than REScheck. There's a lot more going on in the back end of the calculations for a commercial building than there is for a residential building.

[1:12:00]

All right. So I put retail. Square footage of my roof. Now this would be where the -- again this is similar to residential and commercial. Where is my insulation being placed? If it's at the roof deck then I'm calculating the roof deck, the square footage of the roof area, the roof line. If I'm insulating at the ceiling then I'm putting the square footage of the ceiling area. It's insulation placement is where the total square footage of that gross area is. That's what you're entering for your takeoff there. So I don't remember what I put in the square footage over in the project tab so let's just put 1,200. Then your proposed insulation value in for your roof. And it recalculates the U-Factor similar to the residential tool and you continue on.

You'll see down at the bottom it says TBD. I have two project types so why it's in red down here is I have defined only one building area type, but in the project tab --

[1:13:00]

-- I've defined two. So it will stop right there and say wait a minute. Even if I showed everything as retail this still would come up red because I'm showing two building types in the project tab. So it's looking for well where are the assemblies that are part of that office? Where are those at? Because that makes a big difference in the overall calculation and the overall results. So let's put in some exterior walls here. So I'll do wood frame and let's change this now over to the office. Oh, I did the office and I did the switch. One was 1,000 square feet and the other one was 1,200. So I'll fix that.

But anyway these are exterior walls. They wouldn't be 1,200 because I'm taking the height times the length of all my new exterior walls for this addition and adding them up if they're the same construction type, same R value of insulation. If they're not then I would do each wall separately and --

[1:14:00]

-- typically with commercial buildings you're defining out your walls separately most of the times anyway. And then the windows and doors that are represented in that wall would be shown underneath it. So I will just put in 1,500, arbitrary number that I've added up a couple of exterior walls there. And what am I insulating those exterior walls to? So I'm going to put R 19 cavity. Let's say I have some foam board and I'm going to put R 10. Continuous insulation is typically rigid foam board, insulated sheeting with no thermal breaks, not between structural members. That's what continuous insulation is. So I'll put R 10. That's a pretty nice value. So it's a nice insulated wall for a wood frame wall.

Again, down below at the bottom the envelope gives you a percentage. It doesn't do that with the alterations, only additions on new construction.

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And TBD for the lighting and so forth. So this is really the basics of additions that's similar to REScheck. I'm not done with my addition here. I need to finish defining that building space, that addition. So I probably maybe going to have a floor. Where's my windows and don't forget about windows. You have a threshold. I show that to you with that 30 percent. Let's take a look at windows real quick. There's some more details that go with windows for additions and alterations.

So let's do wood frame operable. Now we're getting some more details involved. So the next screen that comes up is fenestration performance details. And there's three options you can choose from. The first option says NFRC site built. That's site built. Nothing else but site built windows. If that doesn't apply to your fenestration don't even choose that button, but let's choose it so you can see what it does.

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We actually upload from the NFRC database, the site built specifications that they have and their database for site built windows. This was a feature more or less just a nice time saving feature for users for site built windows. Again, is everything site built? No, but it's there and it's kind of like a nice little thing that we've added and we worked with the NFRC to add this into the tool. If you don't know the CPID number, we have a link out to the NFRC database and you can go find it because again, we only upload that data once or twice a year. So there still could be a product in the NFRC database that might not be in there. And then you can click get data if you have the number. But keep in mind – and then here shows you a value. As I skimmed over it showed you a CPID number, but all right. Let's get away from site built.

[1:17:00]

That's again site built only. Let's take a look at option number two. Now this is where typically most users spend most of their time. So energy code default values in the commercial. Again, the worst case scenario and for alterations they are not going to meet it. You're not going to meet it because it's very prescriptive, right? Windows have to meet individually. Walls have to meet individually. For additions you could do tradeoffs, but it's going to be really hard to do. They're worst case scenario, but they're there. So if you had a product that wasn't NFRC tested per code, then you'd have to use the defaults. But we're not going to use them.

So product performance evaluated – this is where I have my NFRC product and I'm going to go find my specs and I'm going to enter my values. So I'll put in some U-Factor and the solar heat gain. And I put in my product ID or pending ID, whatever might be. So it's the product rating on the window.

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And I hit okay. so I'll come up here and I'm going to enter the area of my windows. Projection factor is the overhang. So how do you calculate the projection factor? We do

have a diagram that's in the help menu. You can go take a look at that. It gives you how to run that calculation for that overhang. If you don't understand projection factor go to the help and take a look at that.

So there. I've entered the windows and I'm still working on my addition. I'm not over a threshold limit, but if I come up to the view menu and I go to glazing requirements it will bring the area-weighted U-Factor that I talked about, you know, as I was talking in residential. It's individual products. I've only showed an operable, vertical fenestration here. And so if I was to do fixed vertical fenestration, area weighted averages are only done for each individually. That's what the code says so that's how they're calculated in the tool. And then you have solar heat gain –

[1:19:00]

-- maximums and they're based on that projection factor. So go back and take a look at this and spend some time with this so you can understand how the fenestration works if you're in 2015. All right. I could keep going through and defining my addition, but I don't want to be short on time and we're getting close to the end of this webinar. So I'm going to jump over to lighting.

With lighting it's very straight forward whether it's an alteration or it's an addition. An alteration would mean that that threshold limit of the 10 percent, but I'm replacing more than 10 percent in that existing space then that entire space has to be brought up to code. All right. So I could have existing lighting and I could have new fixtures. I've got to add both of them together and I've got to add my takeoffs for both of them. So let's just say we're still on addition and we got all new lighting in the addition. I have the option to choose from code. I can do it by building area method or I can do it by space by space.

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And typically with additions you're looking at the space categories. Alterations the same thing because it's space specific. So let's take a look at what we have for spaces and define just – we're going to come up with one and so you can see how this works. I'm going to come down and I'm going to put in a sales area. And I'll just put in 1,000 square feet or assuming that. Okay. This gives you the watts per square foot so that's what you're working with and there's your area. So it gives you the allowed wattage per square foot. Then if I'm doing exterior lighting we'll take a look at that in a minute too.

So let's come over to the interior lighting tab and I would – if I had more than one space type, you highlight on the space and then you start adding your fixtures. Really straight forward. It tells you what you're allowed wattages is, but zero is proposed because I haven't entered anything yet, right. So I can come up and I can add fixtures in. I have a big library –

[1:21:00]

-- in here for what I've been working with so I could choose from my library. If you're new to using COMcheck you can create your own library and it can be as big as mine or bigger. I can add new. So if I wanted to add in new LEDs and save them as a specific, you know, fixture that I'm going to use all the time I can do that too. So there's more to lighting than just showing your lighting fixtures. There's controls. There's occupancy sensors. There's all different sort of things that actually you need to look at besides just the fixtures and the allowed watts per square foot and are you meeting it. And all those provisions sit in that requirements tab.

So we're going to go through that and make sure you're abiding by or that you're confirming that you're meeting all the rest of the provisions and based upon what you're doing in your linear space for your addition and or alteration, depending. So here we got lamps per fixture.

[1:22:00]

LEDs, typically just one. Number of fixtures I'll just put in a number and then my fixture wattage. I'm going to right click and I'm going to use the default, which it already gave you what was seven watts. I was going to put seven in, but what if I had two lamps? If I had two lamps per fixture then it wouldn't be seven watts. This is the total fixture wattage. So then what seven plus seven is 14, right. So I'd put in 14 there. And then the number of fixtures so it totals it up. So this is of course low. My proposed wattage is 280 and my allowed is 1590. I'm just making some lighting up but I just want to give you an idea of how the actual function works for entering for an addition for your lighting.

Again, one more thing to show for lighting is – let's click on options. And now I'm coming over to interior lighting and exemptions and allowances. This is – what if you have decorative lighting? What if you have sconces on the wall or you have some allowances?

[1:23:00]

Well they come from the code so they're code driven. And it will bring in another column and it will depend on the fixtures that you've entered there whether you have an exemption or an allowance depending on what you're doing, the lighting design that you have in your building.

So here are the choices and how they work as far as whether it's an allowance or an exemption would change whether it will go towards your allowed wattage. It will add more allowed wattage or it won't go against your proposed wattage. So an exemption would mean that it's not going to add additional wattage to your proposed calculation over to the right at the top here, the 280. Okay.

So if one of those was matching what I was doing in my space then I would choose it. SO like retail display window and it's an exemption. I would add that in and look. If I

said that, look at my proposed wattage. It's now down to zero. That's what I meant as an exemption. It looks at proposed. It goes against your proposed –

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-- and then allowances towards your allowed. Pretty straight forward. Anyway, this for a new user sometimes they don't realize that the exemption allowances are there to show the rest of what's going on with their lighting design. But you have to choose it from the options and you have to be in the interior lighting tab for it to be activated. So when I say activated I mean you come up to options and you can click it and then it will show it down into your spread sheet.

All right. Let's move back over to the project tab and let's take a look at exterior lighting real quick. And with exterior lighting and I'm on addition still and then we're going to look at alterations real quick and then we're going to go look at resources and then we're done. I'm sure there is plenty of questions and I will not probably get to all the questions today, but I'm going to do my best to answer as many as I can.

So this is code driven. Exterior lighting zone comes from the code and you need to specify which one is applicable to this project where it's located.

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So I could say developed rural area. Whatever which one is applicable is easy enough. You define it. There is more that comes with that exterior lighting zone in the code. I'm not going to go into more detail about it, but if you have questions we can go over that individually. So let's enter some exterior lighting. And with exterior lighting there are some tradeoffs. So there's tradeable and non-tradeable areas, and it will show you in the last column here whether it's a tradeable or non-tradeable.

And it's take it or leave it. Meaning if I had an ATM machine it's not tradeable and I can – and it's based on quantity. So this is a very important column here. The quantity really shows what you would be putting in based upon the lighting application. So this one is based in units and you got to look at the units to understand what you're entering. And you'll get this here in a minute.

[1:26:00]

So if I put in ATM which this wouldn't be – I'm just throwing some things out at you so you can understand how they would actually work in the tool. So if an ATM I look at my units and it says machines. That's really important. So let's add two machines. And then you would go to the next one. SO let's take a look at another one so you kind of get the idea of the lighting application, why these change. All of them are different. A lot of them – I mean they're different and the tradeable or non-tradeable.

So fine. Let's say I have a main entry. As you see the units here – did you see how I kind of scrolled this over kind of like spreadsheet in Excel spreadsheet. I can, you know, expand that so I can see where these units are. And you're going to want to do that because some of them are a little bit longer. So you're not missing what it's telling you that it needs you to enter for as far as your quantity. You don't want to have that wrong. So this one is the feet of the door –

[1:27:00]

-- width. Right? So some are a little interesting, but that's what you're putting in for your quantity. If I go to a different one here, and I'll go to one more. And that one says yes for tradeable. So I can trade that against another part of my lighting, my exterior lighting project. Let's just go to parking area. That one is in square feet. So a little bit different, but – all right. So I've entered my exterior lighting in applications. I'll leave those in red, straightforward. And it gives you the watts per unit, tells you whether it's tradeable or non-tradeable.

We go over to the exterior lighting tab. I would highlight on each one of the ones that I've entered for my lighting types that I've entered over in the project tab, and then I would start adding my fixtures. And it will start calculating against your allowed versus your proposed. If it's non-tradeable you can't use it against your tradeables meaning I'm only allowed up to that –

[1:28:00]

-- 360. I can't go over. However, in the other ones if I had some totals in there I could be trading in between all those. So if one was over and one was under I could trade in between those two as long as the overall compliance was met. And then you're okay. All right. So that was light. Let's go to mechanical.

So for an addition if I have – you treat it as new construction basically. So with the mechanical system it would be the same. You know if I had a new heat pump or whatever it might be I'm going to be entering it in for the addition. Alterations area a little bit different but I will get to that. So this one, this isn't a pass or fail at all. When you enter your fan systems you'll get into entering some information as far as fans that does a little bit of calculations, and there also gets involved as far as exemptions and economizers. So let's just play around with this because there's so much involved with mechanical.

[1:29:00]

And I mean we can get really complex with mechanical systems. The more complex it is, the further the information that you'll need to enter into COMcheck basically. All right. So let's put a heat pump in. And let's just say it's a split package, vertical unit. And we're going to say it's a single zone because this is an addition. So I'm going to keep it on a single zone and we'll put it as a perimeter. And I can click okay. It gives you the heating and cooling mode. You have to put in the capacity and then the system details and the

proposed efficiency. The minimum efficiency comes from the tables in the code. So pretty straight forward that you've got to meet those minimum efficiencies. If you're not, then you know, it's not meeting compliance. Other than that, other things that can come into play would be –

[1:30:00]

-- based upon your capacity of your system might put you into whether an economizer is required. And there are provisions in the tables that show if you're over a certain capacity, heating capacity then you would be required to put in economizers. So I will put in some numbers here. And I'm just going to say my COP is the same. My cooling, I'm in Texas. And now that I've put in cooling that's over the threshold that's in the code, there's a capacity limit in there, it will pop up the display for an economizer. So I put in economizer.

If I say I have an exception I could do that. I could put no economizer but I've got to define what that exception is, whether it's based upon a heat recovery system, a VRF, outdoor central unit. That might be applicable. Or do I have an economizer? So I'm going to list that I have one and I'm going to click okay. and then I would put my proposed EER –

[1:31:00]

-- efficiency. Those change based upon the system that you're entering and I'll keep it the same. So let's – I mean I could play around in mechanical for hours and basically our code trainings from mechanical could be a full day of just going over the code of the mechanical systems. And this isn't a code training today. I'm just trying to give you the feel of how you would show compliance for mechanical systems for an addition and for an alteration. It's similar. Same thing if you're putting in a new unit or you're replacing -- unless it's like for like – and those popups come up to tell you whether, you know, it would be an exception to the alteration.

So I can come over and put a cooling system in. I can put another system in if I wanted, and I can go into fans. I have in the COMcheck basics video how to enter fan system details. So I'm not going to show you fans today. Same thing applies.

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So I highly suggest if you do not understand or you're new to entering mechanical systems in COMcheck and fan system details go take a look at the COMcheck basics video. Same is similar for plant. Pretty straight forward for plant. It's hot water or steam, but also water heating. I'm going to hit cancel and go over to the water heating. If you're putting in a water heating system, same thing. Pretty straight forward, but it gets really more involved in the requirements tab depending on how much detail you have in your mechanical systems that are in here.

But again, that really gets – it's very code driven too. More or less it's a COMcheck mechanical code training is what I would call it because there's just so much involved and you can get into systems that are very complex. So anyway, I would suggest that you go take a look at the COMcheck basics video until you get a good understanding if you are new to entering these different systems because again, for an addition –

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-- if you're entering a new mechanical system for the addition it needs to comply or service water heating, whatever it might be. Same for an alteration. And I showed you those in the power point. So let's go over to requirements. Now there's a lot more buttons and I have project, envelope, interior, exterior and again I might not be using all those. Maybe I got an addition and all I'm doing is the envelope so I would never touch on the radio button that says interior lighting. But if I have entered for all this then I want to make sure I go through each of these provisions.

So you click on envelope and basically it will give you the code section in the code what the typical provision is for that and are you going to meet it or not or does the requirement doesn't apply. So the first one on the list just to give you an example is in the code that building envelope has to have a continuous air barrier. Plain and simple even for an addition, continuous air barrier. That's what we're on. We're on additions so that those new building envelope –

[1:34:00]

-- assemblies for the addition has to have a continuous air barrier. That's a mandatory requirement. You can't trade it off. So is that requirement going to be met and where is it on your plans or does it not apply? I don't know if it would not apply, but there could be some reason why it wouldn't apply, but we won't go into that. So then, you know, go through each one of these. Click whether it's going to be met, whether you have some exception. Each one of those should be gone through before you create that compliance report.

And it will actually start this little bar down at the very bottom. As you start entering your check marks and that you've gone through each of these provisions it will show you down here at the bottom. I'm just hitting your requirements comply each time. But the little bar down at the bottom gets bigger and bigger and it tells you the percentage of the provisions that you've actually verified that you've gone through. So pretty important that you take a look at all of these. Then that makes your report complete before you submit it because these are all the rest of the provisions that come from the code.

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Okay. With that said, I am touching on a lot of information today. There's a lot of detail and I'm now just going into alterations. And I've got 20 minutes left and so that's kind of scaring me because I want to have time for questions. So I'm really going to go a little

quick on alterations, but I think you have a good understanding. I hope you do about the functionality of how this works, and each alteration is different. Each addition is different especially for commercial buildings. There's all different things that can apply or not apply and they're very code specific depending on what you're doing.

So again, if you have questions, we do have a resource to go to our help desk that you can ask those questions to. So let's take a look. I'm going to hit new up here and be done with this real quick overview of additions and say no, I don't want to save any of that. And now let's click on alterations. And it will actually have this warning.

[1:36:01]

If I have data entered for an addition and I go to click alterations you'll lose it. Alterations is its own feature like I mentioned it in REScheck. The same applies to COMcheck, very prescriptive. It's not giving you any tradeoffs of anything, not lighting, not envelope. Very prescriptive. Each individual thing has to meet code individually. Done. So let's say yes and let's take a look at some of this because this gets into a lot more detail.

All right. So you have the tabs up here for building envelope. I'm going to enter a retail space and I'm going to put in 1,000 square feet. Okay. Then we come over and let's go to the envelope. I want to change my location though. I just – you know, I just love that Texas. I'm going to change it back to Texas. I don't know. It stuck on it the other day so I got to keep it that way. All right.

[1:37:00]

Climate is on 4-B so we're still on 4-B. So let's go over and each one of these radio buttons in here, the blue and white buttons has a drop-down list of assembly types. It's typical, however, I'm only going to choose the ones that are applicable to what I'm touching in that existing building. So if I'm doing roof replacement, not repair -- I can't believe I said that – roof replacement, I define what type of roof it is. And then the same provisions in the very beginning I talked about that come from code are your exceptions. Do one of those apply to your roof construction that you're doing? If they don't then you would hit no exemptions apply. And this is where it gives you – okay.

Well, here's the max U-Factor and here's what the typical insulation value would be to meet that maximum U-Factor. Really nice feature especially if you don't have the code book with you. And then I hit okay. Come up here and here's all the columns that we have that we're working with and there gets to be more --

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-- with alterations you'll see more columns as we go through some of this quickly. So alteration details is where I say if I have an exception or not. Here's where you would put your insulation values in and I haven't done that yet. And look; it's in red because I

haven't entered what I'm insulating this roof to and my maximum U-Factor off to the side. So I got to insulate that thing. And let's put R 38 because that's what it recommended with meet code and it does. Down below it says it's passing. All right.

Let's go to the next one. I'm going to show you skylights and I'm doing my post-alteration. So go over the skylights that I'm putting in. And remember when I talked about the 3 percent threshold and the 5 percent? So let's take a look at and refresh your memory on you have a skylight to roof ratio that there is a limit or you have to go total building performance. This is not a site build. This is an NFRC –

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-- test-rated, labeled skylight. So I'm going to choose option two. I'm going to enter my ratings from my specs or from my label. I'm going to enter my solar heating and my product ID. And I'm going to hit okay. And then it's going to ask well, is this alteration, is there an exception for it and I'm going to say there are no exemptions. This is where with skylights and with windows it will bring in with the skylights it has no greater than 3 percent unless I'm doing that daylighting allowance that I showed you in the presentation at the very beginning which you're like well how do I get that extra 2 percent.

How do I get that extra percentage for the windows? Well, before you put your percentage here let's say you have 4 percent. And if I put 4 here it's going to kick me out. It won't allow me to do it. So I can come up – well let me hit cancel here and then we'll go back to it. I can come up to options.

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And I can click on daylighting allowances and skylight area. Similar to vertical fenestration when I talked to you about the 30 and 40 percent threshold, that's where that would apply. Now let's go back down. Let's click on the alteration details and let's say there's no exemptions. And now it's at 5 percent. But that's it. If you're over for the alteration or if you were doing an addition – this applies to both addition or alteration this would come up. You're done. You got to go performance based and that is not what COMcheck does.

All right. So I'll enter 4 percent. Okay. And I'll hit okay. Similar thing applies if I was to do windows right now, but you saw how that worked and different provision. Down below it says I'm passing so basically I'm going to go through and the alterations are straight forward. Again, different exceptions can apply.

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Basement, floor – I can do a wood frame floor and different exceptions to that and if I say no exemptions I'm going to get that nice little feature that gives me that max U-Factor and the framing cavity, what would make it meet code. And I hit okay, and it's in red so I'd come over and I can enter R 30 for my floor and I'm still – it's still saying I'm passing.

So looking good. I don't think there's much more to say because the functionality – I've kind of gone over this with the additions part.

Let's go over to interior lighting. I've got to come over and really I mean with the interior lighting you're dealing with a 10 percent threshold. If you're replacing more than 10 percent within the space then the entire space has to meet code. So you would enter it. You would come over here and enter your lighting space type, what it is and square footage and start entering your fixtures. And it's pretty much that simple.

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But you need to make sure that when you get over to the requirements tab that you are confirming all those other lighting specifications that are in the code. And that where you're going to spend a lot of your time is really going through those provisions. So I'm going to – we're just hitting the button with 15 minutes left and I want to get back over to the presentation here and give you a couple of more resources because I've gone through a lot of material today. I mean I've really touched on a lot of things and use this as a resource.

Use these slides as a resource, but we have full slide decks of all the code versions, all the last three code cycles. So I have the entire slide deck for 2015 for commercial. I have it for residential. If that's something that would benefit you go out and grab it under energycodes.gov training. Here's some screen shots of some other things that we have. We have code notes. We have –

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-- resource guides. We have FAQs, all of those training materials. We have the help desk, technical support. You're going to hear me because I oversee that and so forth. So let's go to some other resources. I want to just touch on real briefly, real quick. This is Building America's program. And this is for residential buildings but the reason why I'm showing it to you today is because they are adding a new feature. And if you're not familiar with the Building America Solution Center and you do residential buildings, go spend some time with this. This tool has a lot of good information. It's an excellent resource. It really is and plus I add stuff to it. I write some of the code briefs or a lot of the code briefs.

But anyway, they're adding a new feature for existing buildings and it's going to come maybe in May and right now it's called the home improvement guide tool. So look for that. Keep that in mind because there's going to be a lot of provisions for existing buildings, best practices –

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-- could be based on climate zone, could have some code provisions in it, but this is something that I think will be a lot of value to you if you do, if you're a residential builder

doing residential retrofits and alterations to existing buildings. I mean it really will be very helpful. But anyway, let's take a couple of screenshots so you can understand what the Solution Center does and then we are just about – I'm going to take questions.

So if I go into this Solution Center it's really broken down by guides and then by components and then by some other things such as energy star homes, zero-energy rated homes and EPA indoor plus. I'm not going to get in details of those, but it has those in there. And it also has some other resources. So it has CAD drawings. It has image files, case studies and it has my specialty, code briefs. Those code briefs provide the code provisions for an actual technology or a best practice. Go take a look at those. They were, the intent of those were for code officials –

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-- and basically if they were up against a code barrier, maybe something wasn't acknowledged in code then we'd write a code brief so we could outline the provisions in the code and how you would go about complying with that provision or that technology, what it might be. This one is air sealing for multi-family party walls. And there is – this is the best practice on it, and there is a code compliance brief. And just happens to be there is some things that are going on with multi-family party walls and sealing them so we're working on that on the Building America Site. If you're interested we can give you more information on that.

But here if I was to click on the code briefs on the left-hand side of the Solution Center that it gives you the whole list of all those code briefs. But there's more in there. I mean go take a look at this thing. I mean it does have a lot of information so I really wanted to show it to you today. So it gives you just another additional resource. But again, if you have commercial buildings then you're going to want to go out to building energy codes website, energycodes.gov and here is the screenshot of the training page. Here's the webinars that we've already done –

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-- just this last year and we've done two this year, this fiscal year. And they're all recordings. And we're recording this one today and you know, hopefully you got a better understanding of how to use the tools for additions and alterations. And I'm going to stop right now and we can go over a little bit too because I know I had a lot of information I had to cover today. And I'm looking at a little less than 15 minutes. So I want to make sure I can answer as many questions as possible.

Jennifer, I'm going to hand it over to you and I'm ready to start taking questions when you are.

Jennifer Williamson: Okay. First question is if you have an existing building that is having the envelope renovated and at the same time you're adding an addition that connects to the existing building, how do you do COMcheck?

Pam Cole: So I showed you a co-provision how you can show your addition and alteration as long as –

[1:47:00]

-- the total usage is less than the existing building. That gets into a lot of detail and you really have to read that provision and go well how do I do that. Okay. Let's just ignore that. Let's scratch that. Let's do the simplest way we can show compliance which is if I have an existing building that I'm doing some alterations to and over on the north side I'm adding this nice addition, I'm going to have two separate compliance reports. I'm going to have a compliance report for the addition and one for the alteration. Those are two different ways COMcheck is calculated in compliance. Alterations are very assembly-specific and compliance-specific, meaning each assembly has to meet code individually. Where additions, you got a little bit of tradeoffs you can do. So again, show two separate reports. The fastest way to do it and it's easier for the code officials so they know exactly what's going on with the building, that you're touching something on the existing part and then that you're adding some new conditioned floor area –

[1:48:00]

-- over another part of the building. All right. Next question.

Jennifer Williamson: Okay. Would an addition or a change of occupancy like the garage conversion that you talked about require a blower door leakage test?

Pam Cole: Well, yes. So if I'm adding on an addition, you're asking do I have to do the blower door air leakage because does that come into play? This is where there are some interpretations in the 2015.2, but if you're adding square footage then you should be doing a blower door test especially if you're thermally isolated. So let's say I'm adding in a bonus room and it's going to be thermally isolated. It's fair game for doing an air leakage test to that. However, if you have an old building and you're adding an addition to you might not meet that air leakage test. If you're not doing alterations –

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-- and you're not required to bring up the rest of the building and air seal it, make it tight or whatever it might be. So it depends on the project let's put it that way whether that code official is going to require you to do the blower door or not. And the air leakage requirements in the 2015, you know, you're dealing with a 3 ACH or 5 ACH depending on your climate zone. So they're getting down there where if you are below 5 ACH per, you know, condition floor area per 100 square feet of conditioned floor area you're doing mechanical ventilation in that home and that's required by code. So there's a lot more involved in getting into blower doors and air leakage testing and so forth. And that might be something that we should talk offline individually. And I'll leave it at that. I'll let you give me the next question.

Jennifer Williamson: All right. So in COMcheck, when you're defining a basement wall on the envelope tab and you have –

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-- the sloped grade that exposes a portion and partially buries another portion, do you take an average or do you make two entries, basement and non-basement?

Pam Cole: Oh, definitely take an average. So if I have a slope and I'm looking to slope and let's say it's 60 percent I'm going to look at – let's say it's an eight-foot basement wall. And so in REScheck and even in COMcheck there's additional entries. It wants to know the wall height so you put in eight feet. It wants to know depth below grade so you would put six feet, right. And then depth of inside grade. That's another one. And then depth of insulation. Code requires you to have full height of that wall needs to be insulated to meet minimum insulation requirements.

Those are all entries in the software, but definitely take an average. The only time you'd break a basement wall apart that I would suggest and you would want to do because it would be way too hard to do that calculation by hand, unless you're an engineer and you run these numbers all the time -- you can be an architect and run them too. I'm not saying that –

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-- but is if you have two different building components. Let's say I have a foundation that only goes up four feet. So I have a concrete masonry unit that only goes up four feet, but it's only partial of my basement wall and then the rest of it is framed in and that's my entire basement wall. How do you show that? You know, you don't have an option in the drop-down list that says oh, it's a composite of a wood frame versus CMU. No. That's not an option. So you could break that basement wall apart and show the two separately if you wanted to and that's how I would do it. Okay. Next question.

Jennifer Williamson: We had someone ask if you could spend a few minutes describing the difference between the UA tradeoff, the performance alternative and the prescriptive method.

Pam Cole: Okay. UA – well let's just start with prescriptive because UA tradeoff is prescriptive. It's under the prescriptive provisions.

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And in 2015 there's an R value. You can show compliance based on the R value calculation, the R value method, the U-Factor method or the total UA. REScheck is the total UA by the way. U-Factor times area. And then you get into – and those are all prescriptive except the last one, the total UA allows you to do tradeoffs in between your

assembly components. If you were just to do the U-Factor alternative, you're going to the U-Factor table and again, it's prescriptive, and each individual assembly would have to meet that minimum U-Factor in that table. Or if you're doing just prescriptive you're looking at the insulation fenestration table that's in the code and you're going to the climate zone and you're looking at the R value of insulation, and you're going to confirm to the building department – it wouldn't be with REScheck because it doesn't do that prescriptive. It does it with U-Factors, but you probably would end up using REScheck, but you would just show your insulation values and that you're meeting that table.

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All those other mandatory provisions in the code that you still need to show that's why REScheck is a really slick tool because we've imbedded all those into the tool, so you have the whole family, the whole set of the code requirements. And then the last one, the performance alternative, REScheck does have a simulated performance alternative I did not show you, and it is very, very specific to only solar gains, solar orientation and overhangs. It is not full performance based. You would need to use a different tool that does a full performance-based energy analysis of the building. That is not what REScheck does. Okay.

Jennifer Williamson: For an addition, can you use an existing sliding glass door with an unknown U value as part of the new wall assembly?

Pam Cole: You can, but if you don't have the NFRC rating on that glass door and a sliding glass door is square footage –

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-- you're tradeoffs are based on U –Factor times area, right. So you are going to have to find something to trade off that really, really bad U-Factor to make up for it. And there are some thresholds meaning that area-weighted average I explained to you for the U-Factor and the solar heat gain, there are limits in the code. And it depends on your climate zone. So you might not meet code with a non-labeled, tested NFRC product. It all depends and it depends on what else you're doing with that building.

So that's why I – I go on the side of an NFRC rated product right off the bat so you're not in a situation that you are deferred to have to use those energy code defaults and you're not in compliance because you're going to have to go back and redo it and find some products that do. And the codes really push you to using better fenestration and you want to use better fenestration. You know, the whole intent of the energy codes and standards is to have a comfortable, energy saving home, right?

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So you want to be saving energy. It's comfortable and that's what those new windows do and anywhere, like in Washington state where I'm from, you can't even buy a bad

window. You can't even buy a bad slider. U-Factors are just common here that they're low and they've been used for years. And it happens in a lot of states. So you know, you can find these products. This isn't something that should be that you can't find them. I mean they're everywhere. Anyway, all right.

Jennifer Williamson: If you are finishing an existing unconditioned basement by providing sheet rock walls along the perimeter but you are not providing heating or cooling, do you need to insulate the new walls?

Pam Cole: Say that one again.

Jennifer Williamson: So you're finishing out an existing basement by adding sheet rock to the walls but not providing heating or cooling. Is insulation required?

Pam Cole: Well, now there's another factor that depends here. If you're not –

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-- if you're not conditioning the space, if it's an unfinished basement and let's say you're just adding sheet rock, okay. I don't know why you would do that and not heat and cool it if you're not going to make it a conditioned space, but you could. It's based on space conditioning, change of occupancy. Those are the big things. You're really not going to change a basement in change of occupancy, but are you going to put a vent down there? Are you going to run your duct system and have a vent that goes into that basement? If you do then it needs to comply. If you don't and there is no heating and cooling that enter that basement space whatsoever and you want to put sheet rock up, fine. However, there are still other code requirements. There's still fire ratings. So that one provision I showed you on that slide that said don't forget about the other codes, one was the fire code. And you want to make sure that you have a fire-rated, tested assembly –

[1:57:00]

-- and that you're meeting that. And that's another co-provision and more than likely the building department will want to make sure that you have that. I mean you want to make sure that you're meeting the fire code for sure. And you know, other things come into play. So yeah, it wouldn't have to deal with the energy code unless it becomes a conditioned area.

Jennifer Williamson: Okay. So we're right at the 12:00. Do you want to take another couple of questions?

Pam Cole: Do we have a lot? Is there – did you get a lot?

Jennifer Williamson: There's quite a few, yeah.

Pam Cole: Why don't I take two more and we will stop there and again, if your question didn't get answered, this was a really large audience today. Submit your question in through the help desk and those will get answered. So I definitely didn't want anyone who was watching today leave without – if they had one thing that they wanted to learn and they didn't get it answered, then send me that question please, because that's the whole intent of these webinars is to teach you what these energy codes are about, how to show compliance to them –

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-- and the more you know the more compliance we have for these buildings out there. And that's really what our goal is is to make sure we get these buildings in compliance and we're saving energy. So let's take another question.

Jennifer Williamson: Okay. Can you clarify the definition of continuous insulation as it applies to metal buildings?

Pam Cole: No. Metal buildings – that – metal buildings in itself should be its own topic for a training topic and then – there's a lot to do with metal buildings depending on the assembly. If you're talking about the exterior wall, if you have a screw down versus a non-screw down, if you have a standing seam, there are a lot of things that come into play. So this is what I suggest. Let's look commercial. Typically metal buildings get into commercial. One thing I didn't mention is where do all those U-Factors come from and all those assemblies that are in COMcheck?

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We pull those and we call them the look-up tables from ASHRAE 90.1 Appendix A. That's where the baselines are. So for the metal buildings, the screw-down, the standing seam, you'll see those in drop-down lists of choices in COMcheck. Those U-Factors and the R values and the maximum come from the tables in Appendix A. The methodology we use to run compliance in the older codes – not so much in 90.1-2013, but 90.1-2010, is Appendix C. Take a look at Appendix C. So a very good resource if you are showing compliance using ASHRAE or you want to know what those look up values are, the U-Factors, then you'll want to get ASHRAE standard 90.1 and go back to the Appendix A and look at those. There's so much involved in metal buildings that I would – there's too many different scenarios. So I don't want to say something and it get interpreted incorrectly –

[2:00:00]

-- when it comes to metal buildings because there's a lot involved. All right. I'm going to take one more question, Jennifer and then I think we're going to just going to have to call it the end of this webinar.

Jennifer Williamson: Okay. So the last question then is if you are adding a second floor to a single story dwelling, what do you enter for the floor value for insulation?

Pam Cole: Well, is the floor – if the floor becomes an interior floor between two conditioned spaces after the addition of the alteration is complete, so post-occupancy or whatever, post-alteration, then you don't show it. And then COMcheck will assume that that's an interior assembly. So you wouldn't show any interior. So and that's why when I mentioned before COMcheck, you might not have a roof. You might not have a floor. You might only have two walls. It all depends on what's going on with the addition in that commercial building and where it's at that you –

[2:01:00]

-- you know, you don't have a complete building envelope. Okay. Well again, if your question didn't get answered the help desk URL is up here. If you have any feedback for us, any training topics, send those in to us too. And as Jennifer mentioned at the very beginning we do do a webinar every other month on Thursday at the same time. And same time of the week, second week of the month, every other month. So I appreciate you taking the time to learn about REScheck and COMcheck and alterations and additions and thank you. Everyone can disconnect.

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