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Heidi Ellsworth:

Hello, everyone. Welcome to this month's RLW. We'll be getting started in just a few minutes as everyone comes in. Good morning, everyone. This is Roofers Coffee Shop RLW. We will be starting in just a few minutes.

And for all of you who have just joined us, this is Roofers Coffee Shop's, RLW we'll be starting in about one minute or less. So get your cup of coffee and we'll be starting soon.

Welcome to another Roofers Coffee Shop, RLW. Read, listen, watch, where you get to learn how you want to. And today we are going to be talking about sound. When you think about read, listen, and watch. Listen is a big part of it. Well today, the experts at Rockwool will be joining us to talk all about Ruth and wall acoustics. I'm really excited about this. It's a whole different way of looking at things that we're going to lot today. Before we get started, I do want to remind everyone that this is being recorded and this will be available on demand on both on Roofers Coffee Shop and with podcasts, video, and transcripts. So be sure to share this out to all of your friends so they can learn and experience everything we do today. My name is Heidi Ellsworth and I'm the president of Roofers Coffee Shop. And I am privileged to introduce Antoine Habellion with Rockwool, the head of technology. Welcome Antoine.

Antione Habellion:

Thank you and good afternoon or good morning.

Heidi Ellsworth:

Good afternoon, wherever they may be today. Antoine is currently the head of technical at Rockwell North America. He's previously worked in Paris, France. I have had the privilege of listening to him, work with him on this presentation, his knowledge of building sciences, engineering, and especially sound acoustics is amazing. So we're very excited to have him here today to talk to us about this important topic that really everyone who's working within the roofing, the walls, exterior building envelope need to be aware of. So let's get started.

We are going to start with a poll question so that we know who all is out there. So Megan is going to launch our poll and as you know, Megan Ellsworth our producer is in the background. So as the poll comes on, there it is. Okay. We are hoping we wanted to ask if you are primarily residential, primarily commercial or both. So if you could answer this poll real quick and we'll see. Give it just a second.

So, okay, Megan, let's go ahead and show those results. Great. Primarily commercial. Excellent. Thank you so much. And then we also have one more poll question we want to do before we get started. Again, who are you? Contractor, architect, roof consultant, acoustic engineer, building owner or facility management.

Okay, Megan. Great, contractors. Yes. And roof consultants, welcome all of you. I'm so excited to have all of you here today. Antoine, this is kind of a new area that we haven't talked about on Roofers Coffee Shop in the past. So this is really something that I think everyone should know about, but let's start with the basics. What is sound?

Antione Habellion:

Well, this is a great question to start and I think pretty difficult question to answer in fact, so the purpose here is to try to keep it really simple so we can actually move on to building acoustic. But if I was to try to summarize it really briefly, I will say that basically sound is a pressure wave that is created by a vibrating object. And so the vibration that is created sets the particles that are in the air, or any other gas or liquid or solid in a vibrational motion. And this is that motion that transport energy through, so in this case, through the air. And so basically what happened is the vibration set the particles to back and forth around their position of equilibrium. Now the total number of waves that are produced in one second is what define the frequency.

So I think we pretty much all familiar with the frequency. And so this is how we define it now in acoustic, especially in building acoustic, we focus on the frequencies that the human ear can hear. And this is within the range of 20 hertz to 20,000 hertz. So a very wide range. There are frequencies that are above this and these are known as ultrasound. And then on the other hand, there are frequencies that are lower than this below 20 hertz and these are known as infrasound. So as human, we cannot hear sounds of these frequencies, but so for instance, elephants will use the infrasound to communicate and now to try to relate a little bit to building acoustic. The one thing I want to say more on frequency is that low frequency, because low frequency, because they have long wavelength, they are much more difficult to control. And typically the structure that the frequency will travel through will look very thin. So a typical wall or roof assembly will look very thin to a low frequency, so much more difficult to control.

Heidi Ellsworth:

That is really interesting. And as you think about, I mean, everybody thinks they know what is sound, but as you start putting this into, around the building sciences, it really changes it. So let's talk a little bit about what is noise and why we need to control it.

Antione Habellion:

So maybe, sorry, just before moving to noise, I want to talk about one more thing, which is a sound pressure levels, just to give some example and reference. So when we talk to sound, typically we talk in decibels and this can be quite confusing if we're not familiar with the concept. So decibel basically is a reference, is a logarithmic scale that we use because the sound pressure levels of the typical sound that we deal with can be so different to give a numbers which might or may not talk to you, the softest audibile sound will have a pressure of about 10 to the power of minus six

Pascal, whatever that means. And the loudest audibile sound will have a pressure of about 10 to the power of two Pascal.

So wide range with numbers that really, for most of us, probably don't really mean anything. And so we use a scale of decibel, which is basically a ratio between two quantities and these two quantities will be, so one quantity will be the sound that we're trying to characterize. And the second quantity will be a sound, which is defined as a threshold of hearing. So, basically the lowest sound we can hear. And so to give you an idea, so the threshold of hearing will be defined as a reference, zero decibel. And then throughout the different sounds, we will have something such as a normal conversation, will be somewhere maybe around 60 decibels. A drill on the site will be maybe 100 decibels and then a gunshot will be 140 decibels. If we're thinking maybe a military jet, 104 decibels. So this is how we qualify the sound in order for us to better understand. So now, sorry, I just wanted to talk about this before moving to noise.

So what is noise and why controlling it? So noise in fact is really a sound from an acoustic point of view, a sound and a noise, there are the same thing, even though a noise may be made of multiple sounds and it might be made of multiple sounds themself of multiple frequencies. So what define a noise is basically an undesired sound, a sound that we don't want to hear. So what's interesting then is that a sound may be a noise for someone, but may actually not be a noise for someone else. So for instance, you're in a condo and your neighbors are having a conversation and they're watching TV, having a good time. For them there is no noise, they're just having a good time. But for you on the other side of the wall, who maybe is trying to sleep, that might be a different story. So this becomes a noise to you. And so basically noise is subjective, but this is something that is known to have health effect. And so while it's subjective, there is some, I guess, more objective noise that we need to control.

Heidi Ellsworth:

Yeah. Well, as you're looking at that with the effects of noise. I mean, I'm just thinking on a lot of the information that we put out ahead time, it's not just about noise, but it's also about safety. You want that safe space and the effects of noise can cause problems. And so maybe you can talk about that.

Antione Habellion:

Yes, absolutely. And we will definitely talk about safety because especially in the workplace, of course, noise can be a, it can represent a hazard. But noise is now typically recognized as a serious health hazard. And this is quite new. It didn't use to always be like this, and this is probably why we are little behind, in my opinion, in term of acoustic comfort compared to thermal comfort for instance. But if in the 1999 guidelines for community noise, the World Health Organization declare that noise induce hearing impairment is the most prevalent irreversible occupational hazard. And it is estimated that 120 million people worldwide have disabling hearing difficulties. So it is something that is definitely recognized to create health issues, but definitely something that we need to focus a lot more.

And so what are the different impact that it can have? There is different of them. So exposure to high level of noise, for instance, can of course cause permanent hearing loss. And some of these hearing loss, in fact, may not be able to be corrected by surgery or hearing aids. So short term exposure to loud noise can cause temporary change in hearing or the hearing the ringing in the ears that I'm sure we have all experienced after like a night at the bar or after concert. But the repeated exposure to this loud noise can actually end up with this permanent ringing in here, which is called tinnitus or hearing loss. Now loud noise can also create like stress. If you always exposed to noise, it can reduce productivity of course. And I think we are well aware of this here for me because I work in an open space. And of course when there are a lot of people and a lot of noise, of course the sound level can becomes much higher.

It can interfere with communication and concentration. So to me, this one is, it might sound like a little bit of a soft thing, but to me it's very important, especially as a foreigner when I'm somewhere and there is a lot of noise, well, I may actually struggle understanding the person who is talking to me because English is not my native language. So it can actually impair the ability to communicate. So it's very important because communication is really at the basis of every social relationship. And then you kind of talked about it earlier. It can contribute to workplace accident and injuries. If you cannot not hear the warning signal of a forklift or a truck backing up, of course, that can result in an accident. So lots of different else effect. In fact, here, I barely touched on this, there's of course, a very major health effect, including stress, for instance, can create heart issues and things like this. So very serious effects from noise and exposure to noise.

Heidi Ellsworth:

And I think Antoine, as we look at these past slides, really kind of what is sound, what is noise? What are the health and what are the things to look out for? These are all topics that, whether they're contractors, roofing consultants, building owners, that should be conversations during that, whether its new construction or restoration, because tenants are becoming much more, they want to have this safe space.

Antione Habellion:

Yes, they want, but they should, I think. We spend so much time focusing on thermal comfort and we're definitely struggling also with that, but visual comfort and natural light and all these kind of things. But acoustic is kind of always live beyond behind, unless, we are designing like a theater or like a concert room, otherwise it's always left behind. And in fact, I sort of was interesting to share a very briefly, like the result of a survey that was conducted by the Center for the Built Environment. And so it was a survey that included over 90,000 respondents from about 900 buildings.

Heidi Ellsworth:

Wow.

Antione Habellion:

So pretty big survey. And there were lots of different categories that basically they were asking the occupants how satisfied they were. So some of the categories for instance, would be like the amount of light, how clean the building is, the furnishing, if it's comfortable, visual comfort, the thermal comfort, like the temperature, the air quality, visual privacy, all these kind of things. And in the last worst street category is you had noise level and sound privacy, the other one being temperature because people always fight over a thermostat. But out of the last three, we had noise level and sound privacy because this is always left behind.

Heidi Ellsworth:

Yeah. And whether it's a residential building or a commercial building, both are going to be, so like you said, productivity goes down if there's too much noise and sound, but also on the residential side, when you think about the importance of sleep, how many people do you talk to who say I couldn't sleep because of the neighbors. I mean, those are the kind of things that as contractors are talking with their customers or the roof consultants or architects, everybody out there, all these things they think are important and to bring to the forefront, that's steady especially.

Antione Habellion:

Yeah, absolutely. And you know in my daily job, I will say nine questions out of 10 that have something to do with acoustic is about fixing an issue. It's never about doing it properly in the first place. It's always about, oh, I have this neighbor, or the meeting room, there is too much eco much noise in the meeting room. We need to absorb some sound or there is too much noise between the bedroom and the living room when someone is watching TV. It's always about fixing things. Unless it's someone designing a recording studio or like a theater. But it seems that it's either a very specialty room or building, or it's about fixing an issue. It seems like it's very rarely considered for what it is during the design of a typical commercial or residential building.

Heidi Ellsworth:

Yeah. And being proactive, being on the front end of that construction can save a lot of time and heartache later on. Well, let's take, we're going to do one more poll. This is actually our last poll. But we want to ask all of you, do you think about acoustics on your jobs? So seldom, occasionally or always? We're going to give that just a few minutes here is everyone votes. And again, thank you. I do want to remind everybody while you're answering the questions that please ask questions, we will be watching them in the chat and Antoine will be able to answer all your questions at the end of this RLW. So let's go ahead Megan and show those. Wow. Really interesting. So we have some that are always occasionally and seldom. So great. I mean, almost right across the board. So at 38 and 28. So, that is excellent. Well then let's get into that. So Antoine, let's talk a little bit about how to mitigate noise. What are some of the first steps?

Antione Habellion:

So of course, when a sound encounters a structure such as like a partition wall or a roof or an exterior wall, there is various things of both the sound and the structure itself, which is going to influence how well structure blocks the passage of sounds through it. And so the first one, which is the most obvious one maybe is sound blockage and this will depend directly on the weight of the material. So of course, a thick concrete wall is going to do a great job at blocking sound when a light frame walls that we like to build in North America. I come from a different continent and country where we love to use our concrete. But here, we like to build with steel studs and wood frame and this, of course, a very lightweight structures.

And so there are not going to be so efficient at blocking sound. Just to give a rough idea of what it's like, the doubling of a weight of a material will increase by about six dB as a blockage. So six dB is basically, if you recall, it's basically, carrying the sound pressure by a very large amount, by half basically. So this is very major. Now, a common way to improve sound blockage without necessarily increasing the weight of the roof, we don't want to build everything out of concrete necessarily. The proper way is to use multiple layers of mass that we can put together with a space between them. So I think here that's something we understand really well. There's a lot of information about this, in fact, from like gypsum manufacturers.

So it would be for instance, pulling double gypsum board on each side of an assembly and having a cavity in the middle. Of course, this is going to, is going to do a great job because we will be adding mass and at the same time decoupling the structural members where the sound can transmit through. Now, when we do this, of course this is not sufficient. So what we need to also think about is sound absorption. And basically the sun absorption will measure the amount of energy that is removed from the sound wave as it's passes through a material. So typically that material will be for instance, bat install installation, like a stone wool bat installation, that's an absorptive material. This is very absorptive. We will come back on this later. But typically, is a bad material that you are going to put between your mass layers.

And so the combination of all this will, will basically tell you how much sound transmission loss you'll end up with. And the sound transmission loss is basically the decrease in sound energy of air born sound as it passes through like the assembly. So, and this is again a combination of sound blockage and sound absorption.

Heidi Ellsworth:

So it's really the combination, the combination that really makes it work.

Antione Habellion:

So, like with everything, the solution to choose depends on what you're trying to achieve because blocking the sound for an assembly is not necessarily the only goal. That's the goal for instance, between the TV, where there is a living room, sorry, is a living room where there is a TV and the bedroom behind, or the goal between a wall separating two different apartments in the multi family building. But there is also other goals which could be to improve the acoustic comfort of a meeting room. So

there is not too much resonance and things like this and to improve the acoustic of the room itself. So it's a combination of both, but sometimes you need more sun blockage. Sometimes you need more sound absorption, it a depends what you're trying to achieve.

Heidi Ellsworth:

On the goals. And so as you look at that, this is really interesting as you're looking at what that sound isolation in buildings and how the modes of how that works. And so talk a little bit about this.

Antione Habellion:

All right. So the sound will basically travel through different ways and will originate from different ways. So basically the total sound insulation to perform it must address multiple noise first which can come from the above of the room. The room that is above, below, around you and the sound which takes many different past possible. So if we look at the modes of sound transmittance, there's basically three main ones, the air born sound. So that would be, for instance, someone talking in a room, it's airborne, and then the sound travels through the assembly and get to the next room. Then you will have what we call the structural born sound, which are defined as basically the sound that is carried as a structure of a building.

So this is typically if you see on the image, on the slide, the person, for instance, the footsteps, the person walking on the floor above and the footsteps on the floor, this is what we will call structural bond sound. And then we have the flanking sound, which is the sound that transmit between spaces indirectly. So which goes over and around the structures as opposed to through the wall or through the ceiling. So a very obvious one will be, and again, it's shown on the image on the slide will be when we built a partition wall in an office space and we don't bring the gypsum all the way to the underneath the ceiling or the roof structure, but we stop it, basically at the plenum. So while this is of course sufficient from a visual perspective in term of sound, sound can easily travel through that opening, that is between the top of the partition and the roof deck, or the floor. And so this will be a good example of a flanking sound. But there are many other examples which could be the sound travel links through penetrations that were not properly sealed.

So in order to be effective, the acoustic installation, the solution must address all these different sound transmittance. But so again, the sound air born sound, structural born sound, and then also flanking sound. A common mistake and I will come back on this in a little bit, but a common mistake, that we see when we hear from our customers a lot is to address acoustic installation by just like, feeling a cavity in the joist of the floor with bat installation.

And then they're like, well, I put your product. It's supposed to be great for acoustic. And I can still hear noise. It's not really doing much. And it's like, yes, because there's different modes. And putting the bat in the ceiling will do some, but if there is a lot of flanking path, or if there is a lot of penetrations that are not sealed, of course, it's only going to do so much. It's the same as when you do thermal insulation, maybe we

understand it better. And we put exterior insulation, but there's lots of thermal bridging, or we design a roof. And there are so many fasteners that, of course you have heat loss of fasteners. It's kind of the same logic that we put the insulation, we put the mass to block the sound, but we also need to address the different pathways for sound that which are not of the main components, but that's key components of the structure. So again, fasteners and structure and penetrations and so on.

Heidi Ellsworth:

So as contractors looking at this, whether they're working on the roof or the walls, or even interiors from the architectural standpoint. If they're going in for a restoration, they really need to look at all of these different things, basically walking the building, seeing testing the sound back and forth. And I would think from the roof too, if you think about all the external sounds of airplanes, trains, those types of things, really kind of understanding in that roofing system where these gaps are.

Antione Habellion:

Yes. Yes, absolutely. And the common one is, you put insulation in your roof and you're think you're going to have something great. And then every time it's raining, you hear so much noise. So from the rain falling on the metal roof, for instance. So of course understanding whether it's a new on existing building, understanding what you have and what you're trying to achieve is absolutely key to understand, okay, what you need to focus on and what you need to do. There is not always like a simple answer and there's definitely not an answer that will always work everywhere.

Heidi Ellsworth:

So let's talk a little bit about the assemblies. So really this is where Rockwool just excels, but also looking at the overall acoustic performance of assemblies. Talk to us a little bit about that.

Antione Habellion:

So if you remember a minute ago, I talked about these customers that call us a lot and say, hey, I bought your stuff. It's supposed to be great for acoustic installation and well, it's not so great. We definitely get more than we wish. And this is because of course, because acoustic is complex, but because there is different ways to measure the acoustic performance. So the number one is a noise reduction coefficient. So this is basically often the noise reduction coefficient, which is often called NRC rating is a single number, which represent the average of sound absorption coefficient of a material at various frequency and typically mid range frequencies. And so the purpose of that number is to provide a simple way to determine how well an acoustic product can absorb mid-range sound.

So typically it, so there's different important things here. First of all, mid-range sounds, so not necessarily sounds of every frequencies, but mainly it's a parameter, which is used to assess the performance of a product, not an assembly, but a product alone. And so in the case of stone wool, for instance, this is an absorbing material. So the noise reduction coefficient will be very high because this is great at absorbing sounds. So the NRC will typically vary between zero, which basically there is no sound

absorption for that product all the way to one, which mean there will be no sound reflection. And so absorptive materials such as stone wool insulation will have a coefficient of really close to one or of one. It is calculated, of course, after an ASTM measured, I should say, not calculated, but in occurrence with a specific ASTM test method.

But so the key here is this is something to measure the acoustic performance of a product, not an assembly. So sometimes the acoustic performance of a product alone can be very important. And an example will be, the ceiling ties in a meeting room or in an open space, in the open space of an office, sorry, because in this case it will be used to decrease like things such as reverberation, loudness. And so it will be beneficial for like privacy and intelligibility. So the ability to understand someone speaking and for the comfort. So this is really important. However, this is not sufficient when you're looking at an assembly because all components of a given as assembly, I'm going to have an impact. We talked earlier about the different modes of sound transport. And also we talked about, sorry, I lost my mind.

Oh yes. The different way to mitigate sound, sound blockage, sound absorption and so on. So the acoustic, the fibers install, or like the acoustic installation, the material which has a high NRC will be good for sound absorption, but not necessarily good for sound blockage. So in order to actually measure the acoustic performance of an assembly, we use a different metric, which is the STC, which is sound transmission class. And the STC is measured in laboratory. And then it's calculated following some complex formulas, we don't necessarily need to go into the details of this for now. But so when we talk about assemblies, we no longer talk about the noise reduction coefficient. We talk about the STC because this is multiple components acting together. And like I was mentioning earlier, even a great installation product that has great acoustic capabilities which is really good in absorption alone is not sufficient to make an assembly good in term of, to reduce the sound transmissions through an assembly.

So the STC is used to measure the acoustic performance of an assembly, such as a wall or roof and so on. But also in fact for doors, windows and so on. And so it accounts for a wider range of frequency, not just mid range anymore, but from frequencies from 125 hertz all the way to 4,000 hertz. And for this type of metric, the higher the numbers, the better. So typically as a designer, you will need to meet a value from the code, an STC value, or you will want to meet a certain value for a partition between, two units in a multifamily building, for instance, and you will choose your assembly based on that number. And so this number will typically range from like 25, which would not be great at all, the way to let's say, 60 plus, which will be an amazing performance.

And so it's basically a number that simplifies a comparison of assemblies because assemblies will perform differently at various frequencies. But in North America, we use this STC because it simplifies comparison between assemblies because otherwise you will be dealing with mergers at multiple frequencies, and you wouldn't really know which assemblies actually better because one assembly might be better at higher frequencies and other one at lower frequencies and usually it's more complex

than this. It kind of varies all along the frequency range. So we use this STC to compare easily. At the end of the day, of course, this calculation of STC accounts for these different frequencies. So it's probably a pretty good metric to determine which assembly to choose.

Now, there is another metric is the OITC outdoor indoor transmission class. So this one, I think it's pretty obvious from the name is typically used to merge the acoustic performance of an exterior assembly, typically exterior walls. And for the acoustic, I might shock a few acoustic specialists here by saying, this is kind of similar to the SDC because it's not so similar, but to keep it simple here, I'll say it's quite similar in term of how it's measured, what it does, the main difference it's at it account for different frequencies. The frequencies of the noise coming from outside our buildings like road traffic and train and so on are typically lower frequencies because lower frequencies travel further. So the noise that comes from far away that gets into our building are typically lower frequencies. So the OITC will account for this. So it's a better metric to measure the acoustic performance of the exterior enclosure.

It's important to, well, interesting, I guess, to not in the roofing business, for some reason, we love to talk about STCs even for our roofs. So there is a metric OITC that is used for external partition, that better accounts for external noise. But we do like to talk about roofing performance with STCs for some reason. So a lot of manufacturers will provide both in fact, but just something to note.

Heidi Ellsworth:

Wow. Well, and it seems to me that and just to kind of say that back again, because with the roof assemblies, and when we're talking about airplanes, maybe they're recreational roofs where there's people up on them and doing things, you would think you'd want to be kind of looking at that OITC just as much as the STC when it comes to the roofing assemblies.

Antione Habellion:

Right. And in fact, there are even more metrics that, I'm not going to be talking about here, but for roof assemblies, for instance, you may also be looking at ICC. I will briefly mention it later in the presentation, so I'm not going to go over it now, but there is, of course, this is simplify acoustic, really 101, if even. But I don't want to make it sound like, in roofing, we don't look formal. But it's true that most of the conversation I will have with my customers will be for a specific STC for roof, but it's interesting that we don't use all the tools that we have available. We kind of keep it simple, which is good because people calling us for this means they already thinking about it. But they are in fact, next level.

And talking about next level, there is the next level, which is the ASTC, the apparent sound mission class. So the sound transmission class rate the sound transmitted directly through an assembly. So a partition wall, for instance. Earlier, if you remember, I talked about flanking sounds, a noise that go around and find their ways, but instead of traveling directly through the assembly, kind of like go around. And so there is a metric is even used even more rarely. In fact, I'm not sure even I have ever

been asked about ASTC. But the ASTC is basically an STC rating downgraded by the sound flanking path. So it's like, I don't know if it will talk to people here, but analogy I like to make is like when we look at thermal performance, there is our value of the installation. And then there is what we call the U factor or effective a value, which is the thermal performance of the assembly downgraded by all the thermal bridges.

Well, in a way the apparent sound transmission class will be the sound performance, the acoustic performance of an assembly downgraded by the flanking path. So this is really the direction I hope and I believe the industry is going towards. So not just considering the alone, but also considering the other things around, how this assembly fits within a bigger structure.

Heidi Ellsworth:

That makes sense. And so if you take this, all of these ways of measuring and kind of looking at that, let's talk a little bit taking that knowledge on buildings that benefit from acoustic performance. And we just were talking about that, the roof and flights and recreational areas, but also the walls, everything.

Antione Habellion:

Yeah. So, what buildings could benefit from acoustic performance in my opinion, all of them. I think there are very little buildings where acoustic doesn't matter, but all the buildings which have occupants in them like extended period of times, of course will benefit. Now, if we try to keep it more like practical, of course, residential and commercial buildings, in this case, you will care mainly about, I will say the STC or internal partition walls, the on transmission from one room to another, potentially the OITC. So the exterior envelope, especially office building, they may be near busy areas like the highways. And but even if, I am in Toronto, in Ontario and you would be surprised how many condos are literally right against the highway. And I'm pretty sure the people who live in this apartment, which are literally few feet away from the road, how much they would like to have better OITC, typically they're all glazing and they're not so great but hopefully they are getting better.

But this is an area where, of course the OITC will matter. And then finally HVAC also noise that traveling through HVAC noise, and even like plumbing and so on, I think this is a very common one. Then I, another obvious one would be schools and hospital. So I'm saying of course, in this building, you care about the STC of the interior, partition wall for the comfort of the occupants, but for other reasons as well. In hospitals, it will be for instance, for privacy of speech, you may have a doctor delivering a confidential, not you may have, you will have in hospitals doctors delivering confidential messages or having confidential conversation with their patients. So of course, it's absolutely key that they can have this conversation in private and that the people sitting in the room on the other side of the wall cannot hear.

You will also need to have for this sound absorptive ceiling. The acoustic within the room is important. This I think it very talks towards for schools. If we wanted the kids to be able to focus, listen to the class, they need to have a good acoustic within the

room. So in this case, it's not so much about the song traveling from one room to another, just about the room not to be too loud and not to have too much reverberation, so they can actually properly hear the teacher. And whether you sit in the front or in the back, you cannot have a good hearing quality. And of course, HVAC noise, especially in hospitals. I think it's kind of obvious. There's lots of equipment in there. So of course, it's very critical. And finally, another area will be everything that is like near airports, highways, military bases. So, if you built near highways and near airports, of course, it makes sense to really focus on OITC. So the performance of the exterior envelope of the building.

Heidi Ellsworth:

Yeah. As I think about this, too, it kind of goes back to what we said earlier is as whether you are doing re-roof or new because structure or working through these different things, when you have a project and so many roofing contractors who specialize in schools and hospitals, this is something to bring to your owners, to bring to the school boards, to bring to different people, to make sure that they're the ones to bringing this information. I don't know how often that happens, but it's such a differentiator for their businesses to be aware of all this.

Antione Habellion:

Yes. Definitely. Especially like commercial spaces, which are near highways, often or near airports, it's yes. It's a very big difference and I wish we would hear more often about it. So the code is pushing for more performance in this area and so on. But I think we're far behind where we should be, unfortunately. But it is definitely a differentiator. Now it's important to understand that better acoustic comes at a price. So there is good acoustic you can do at cost neutral. It's just a matter of doing it, understanding what you're doing and doing it properly. And I believe based on the result from the polls before, I think a big part of this audience can reflect to this.

But then when we want to do better, we need to understand very clearly what we are trying to achieve, because, again, there's different things to consider from the sound within a room, the sound between two rooms or the sound from the exterior. So we don't necessarily need to be great at everything for any given building. It really depends on what environment we're dealing with, what type of building we're designing. But typically schools for someone who does a lot of schools, with someone who does a lot of hospitals, there is definitely some factors that will be pretty much repeated for every buildings.

Heidi Ellsworth:

Right. And besides, I mean, when we're talking about having these conversations with our owners or with our customers, there's also, of course, there are standards to meet, there are building codes to meet. And so let's talk a little bit about that.

Antione Habellion:

Yeah. So there is definitely a lot of things, in fact. And so of course, I'm going to go extremely quickly over this because it's just so complex and it will just take so much time to go over it in details. I'm not even sure I could do this because it's a bit all

over the place. But I definitely want to make the point that there are definitely some things in the codes and standards. And I'm sure some of the people here listening definitely know that. But so if you look in the National Building Code of Canada, for instance, demising walls will have requirement for like STC 50. So pretty high numbers. STC 50 is not something you're going to meet by accident by doing the typical thing. It's definitely quite a high number. If you look in the international residential code in the US, for instance, you'll also have some ratings.

So in this case, STC 45, you'll have requirements for mechanical, shaft wall for our flow and roof assemblies or ceilings. So the ICC, I was mentioning a bit ago, it's the Impact Isolation Class, which is basically the ability of a flow assembly to absorb impact sounds. So again, footsteps. You will have requirements for mechanical scaffolds in commercial buildings. So, sorry, I should have been more specific. The requirements I just mentioned here were for residential, but they also sound for commercial buildings. So mechanical, mechanical shuffles also. Some requirements or to meet from ASHRAE 189. So ASHRAE 189 is a standard. It's a voluntary standard, it's not a code, but it's just to be clear with everyone, this is a standard for the design of high performance green buildings. And so in the standards you will have for instance, requirement on like wall assembly for conference and rooms, offices, things like this.

So in ASHRAE 189 for instance, you'll have a requirement of 45 or 50 for confirm room in offices. In LEED V four, you will have requirements also for conference rooms and offices of like for the wall assemblies, STC 50. You will have requirements on ceiling ties that you put on your ceiling with minimum NRC. So in LEED V 4.6, you will have requirements between 0.7 0.9. You will also have requirements in well standard. So this really requirements all over the place. Hospitals and schools of course will have requirements. So either in the code of standards, but so for instance, schools LEED V four will have requirements for the internet internal noise level, which can not exceed 40 decibel. So the metric here is a bit different. It's not an STC, it's not an NRC, but it's a sound level.

And so you can address it through different ways. But of course in this case, sound absorption will be a key to ceiling ties that you're putting on the ceiling for instance. There will be guidelines for hospitals with FGI or the Department of Healthcare and Information in California. I mean, there's lots of requirements all over the place. And just to finish on this, because it's a lot of numbers, probably very confusing to listen to me right now. I just want to make the point, it's all over the place. And there are a lot of things out there, but there are also for adjacent buildings. So adjacent buildings of what, buildings are adjacent sense to military installation airports. So the US Department of Defense will have some regulations that are around noise level reduction. So basically this type of requirements will be something like either sound outside as is this amount of this decibel minimum. Then you need to reduce it by at least this amount in the adjacent building, these kind of things. So it will be decibels.

Same thing with the FAA, which will have also requirements for community that are near commercial airports. So for instance, to be specific, there will be requirements such as a noise level rejection of 25 to 35 decibels in areas where the outdoor noise is higher than 70 decibels. So in order to ensure that, of course the noise of the

planes cannot be heard at least not so loudly, in the buildings or the communities that are adjacent to the airport. So lots of things out there, but these are really minimal. So they are great starting points, but is it sufficient? I think as designers or builders, this is the question we want to ask ourself, what can we bring to our, our customer? And potentially this is the type of conversation we can have with building owners, developers to try to do the extra step. And it doesn't necessarily always come at a higher cost, sometime it can just come, it can be cost, it's just a matter of doing things properly.

Heidi Ellsworth:

Well, I think it's so important what you, I just want to read iterate that is look at your local building codes and your local regulations, because you could be around an airport and it could be different there. So following all of these and being aware of just listening, what's the sounds around that. Could this cause a problem. But I think also knowing where to go for resource and really being able to get help because you may see, hey, we're right underneath an airport. I'm just not really sure what we need to do. This is where you go. So Antoine, talk about this resources.

Antione Habellion:

All right. So the first thing I want to say, because as manufacturers, we have to be cautious with what we can do or cannot do. So when someone wants to meet really proper acoustic levels of in, acoustic installation levels, I think the proper way to do is to talk to an acoustic consultant because acoustic is super complex. It's not an easy area. It takes into account lots of things. Again, this is ultra simplified here, what I'm talking about because it gets really complex. However, I do want to point out to the fact that manufacturers like gypsum board manufacturers, installation manufacturers typically will have a lot of resources to offer. So in our case, for instance, at Rockwool, we have like tested over 100 assemblies with so many. I cannot tell you how many we have and we put them in catalogs that you can find on our website or you can contact us to get these catalogs. And in which you will find many assemblies that have been tested because I think it's probably clear from everything we've been talking about so far.

But acoustic performance is like a fire rating of an assembly or the wind, I believe resistance of a roof it's assembly specific. So you test a specific assembly. You end up with the listing. If you change one component of that listing, you're going to change the performance. So this listing will no longer apply. And so you cannot just put gypsum board and put installation and boom, you get an STC of something. It has to be tested. And to meet that number, you need to build exactly the same. So we have catalogs that will describe precisely. So there isn't actually an image here for our roofing insulation catalog in which you will find some STC ratings of roofing assemblies and will describe the assemblies layer by layer and provide various options.

So contacting manufacturers for catalog catalogs and tested assemblies. So we have floor and ceiling, interior partition walls, exterior residential and commercial walls, roofing assemblies, and so on. And we have wide ranges based on what you're trying to achieve with STCs going from 26, like pretty much basic STC 26, you don't really

need to come to us to do this. You can pretty much do whatever it will get that. But all the way to like 53 for roofing, but we even have a higher, better assemblies in for wall, like all the way to like close to 60. And then also with OITCs, again, to remind everyone, OTCs are typically lower than STCs because they account follow frequencies. But so, manufacturers do have test data assemblies that provide a lot of choice.

The general factors that will contribute to higher ratings in a roof system for instance, I will say the multiplication of different materials. So for instance, hybrid insulation, a layer of mineral wool over a layer of polyisocyanurate that's beneficial. If you have a metal deck adding flute fillers like mineral wool wood fillers will provide additional absorption using wider fastener patterns because fasteners of course will create path for sound to travel. So trying to optimize the fastener patterns. Using thicker gypsum cover boards to provide masks to the assemblies. These are like the general things you will see in the listings for roofing assemblies of various performance.

Heidi Ellsworth:

Wow. Well, and as you're looking at that, and we do have a couple questions. So before we get to those questions, I want to really take this from the contractors or the roof consultants view on what they can do. So what are some things that should be looking at doing?

Antione Habellion:

So the first step is defining a goal. What do you want to achieve? Because you need to know specifically what you want to achieve, or at least get help from someone who can help you defining what you need to achieve. Whether it's a developer billing owner, the architect, or the manufacturers who may have experience in testing various. So defining what you need to achieve. Then looking for tested assemblies that exist already, which may meet that requirement. Let's say, you need an STC of 45 looking for, what are the listing available that might meet this requirement, if not you have different options to, of course, to look for an acoustic engineer or consultant, or to do a project specific testing with, or without a manufacturer. But you design your assembly, you get it tested. It's usually good to have a good idea of what you're doing before, because acoustic testing is not so cheap, not so easy to do. So if that's what you want to take, plan ahead.

And finally, one thing I would like to throw out there is to some extent it is possible to do acoustic modeling because there's only so many assemblies we can test, but there are as many assemblies as there are the designers out there. We have tested over 100 assemblies. However, every time we get a request, it seems we never quite have the exact assembly. It's always slightly different. And we always like, huh, I should have tested this one. That makes sense. This is a good assembly, but there is possibility to do modeling. In fact, so for instance, we have our building sense team, they use a software called Install that is well known in the acoustic world.

And basically this software can allow you to do some modeling. So using existing listed assembly. So assembly that have been tested in a lab, you can model this

assembly, calibration model and then extrapolate. So let's say you don't have one gypsum board, but you have two, or maybe it's not half inch, but it's five, eight. You don't have three, two and a half inches of insulation. You have four inches, you can extrapolate. So we can account by using modeling tools. We can kind of like increase virtually the number of tested assemblies we have. That's why it's good to talk to the manufacturer because while they may not have your exact assembly, they might be able to still provide guidance on what your assembly, if it's close enough, might be. And I want to be clear that this modeling is accurate. It's in fact, within three STC point, which is pretty much what a lab test will also give you anywhere. So pretty accurate.

Heidi Ellsworth:

Yeah. And then obviously look for that acoustic engineer and also on the Rockwool Building Science Team. So just real quick, tell us about that team.

Antione Habellion:

So the Rockwool Building Science Team is basically a team of building science specialists, which is dedicated to help designers, builders, consultants with their projects. So in fact, we do a lot more than just acoustic. And in fact, our specialty is not acoustic, but more thermal performance and angular thermal performance, but it's a team which can do of as a complimentary service to our customers that can run, can provide advice on what layers to do, what system to design, what membranes to use and can run know things such as angular thermal model, thermal models to calculate new factors, effective values, STC ratings, and validate control the risk for, or I should say, assess the risk for condensation within an assembly and so on. So it's basically a team available to designers, consultant builders, to help them with their project on everything that is about thermal moisture and acoustic and fire, I should say.

Heidi Ellsworth:

Excellent and fire. Okay. Because we only have a little bit of time left. I want to make sure to get some of the questions. So Joe and Russ, thank you so much for your question. And the question is the best way to combat noise from a large ceiling area, creating an echo?

Antione Habellion:

All right. So if there is echo, it means that basically you have a need to get more absorption. So in this case, we talked a lot about the NRC, the noise reduction coefficient. You want to look for a material with a high noise reduction coefficient, which can absorb some of the sound. If there is echo, it means there is not enough sound absorption. So there's lots of the front possibilities. My guess is if you have a large ceiling, you're not planning to suspended ceiling with ceiling ties, but you may want to put like, absorptive panels, whether they're hanging on the safe from the ceiling, they are on the walls or maybe even furnitures, curtains on the windows. You want to add materials with high noise prediction coefficient that can cannot absorb some of this sounds.

Heidi Ellsworth:

Yeah. Because he did say it's an existing partition wall, two layer, five eight fire rated gypsum board insulation with vapor barrier. It's a stairwell with high voltage ceilings creating echo.

Antione Habellion:

All right. So of course, as we know, large volumes will do this. And so again, what's needed here is to add absorptive materials with high noise reduction coefficient. So it depends what kind of building it is, what kind of space it is, but adding absorptive materials. So is there the acoustic panels on the walls, high land of absorptive materials. So it's a residential duplex. So I think, probably adding absorptive materials, such as curtains on the windows, carpets on the floors, chairs with fabric, adding this is probably the easiest way. And then adding panels on the walls, which can provide absorption. So there's all sort of coke, yes, of course coke will provide some, but it's a matter of how much you put. Different materials will provide different absorptions. But definitely adding absorption is a key.

Heidi Ellsworth:

Excellent, John, thank you. Hopefully that helped. And if there's any other questions, please put them in the chat. I do have another one here. And it was basically, if you feel like you need to get acoustic modeling done, where do you go? How do you find acoustic modeling support?

Antione Habellion:

So again, it depends what type of modeling you need, because there's all sort of modeling that can be done. So instance, in the case of John, we wouldn't provide that kind of modeling to assert the amount of absorption done by adding either panels or absorptive panels, islands hanging from the ceiling or adding furnitures, because this is something we wouldn't have the expertise to do really. But we have one sister company called [inaudible 00:59:15]. In fact, that mix ceiling ties. So with their own very specific solution, they could do this. But otherwise, in this case for that kind of modeling, you probably would want to talk to an acoustic consultant. Now, if you need STC calculation, this is something in our case that, you contact the technical services team from Rockwell or your local sales guys and they all direct you towards the right people.

Heidi Ellsworth:

Excellent. Excellent. I think that is our questions for today and it's perfect timing, we're right at the end of our day. Antoine, I want to say thank you so much. I've learned so much about sound acoustics. I hope everybody else has. And what great knowledge and wisdom that you shared with us. Thank you.

Antione Habellion:

Thank you everyone for your time today.

Heidi Ellsworth:

Yeah. And if you have any questions, you can get a hold of Rockwool through the Roofers Coffee Shop directory. I also want thank Dave Lauer, who is on here. You just can't see him, but he also is very active in the roofing industry. Actually the president of the Roofing Alliance currently. So there is a lot of support on this, around the sound. And as you also so many other things, when it comes to thermal bridging fire. Rockwool is something definitely you want to check out. You can find them on the directory, on Roofers Coffee Shop and along with all of our other information, that's out there from them on articles, presentations, some great stuff.

So again, Antoine, thank you. And thank you all for being here today. This has been recorded. So please share it. It will be live on demand on our site within the next 24 hours. And you can find all of the Read Listen Watch webinars under the Read Listen and Watch section of Roofers Coffee Shop. You can also find out on YouTube and your favorite podcast channel. So be sure to subscribe and get those notifications so you don't miss any of these informative sessions. Please have a wonderful day and we'll see you next time on Roofers Coffee Shop, RLW.