

Episode 5: What Are the Costs, Options, and Challenges of Retrofitting Before the Earthquake to Prevent Injury and Damage and Speed Recovery?

Introduction: Welcome to *Ready to Recover*, a podcast series in which guest experts take a closer look at what people may experience when seeking to finance their recovery after a damaging earthquake. These discussions consider common challenges and options, including what can be done to prepare before disaster strikes. This podcast series is produced by CREW@crew.org with funding from the National Earthquake Hazards Reduction Program.

Taking steps to strengthen buildings before an earthquake strikes can lessen damage and improve recovery afterwards. In this episode, five experts look at the costs, options, and challenges of investing in seismic retrofitting and they describe how retrofitting programs can help.

Our guest host for this podcast is Amanda Hertzfeld, who is the Unreinforced Masonry Retrofit Program Manager for the City of Seattle, tasked with developing and implementing the policies required to retrofit unreinforced masonry structures—also known as URMs. She is joined in this podcast discussion by:

Janiele Maffei, chief mitigation officer and director of research at California Earthquake Authority, and manager of the California Residential Mitigation Program, including the Earthquake Brace + Bolt residential retrofit program.

And Jessica Chappell, a licensed professional structural engineer in Utah and Alaska and Principal at Structural Design Studio in Salt Lake City, Utah, where she currently volunteers with the Utah Seismic Safety Commission, the Structural Engineers Association of Utah board, Envision Utah, and the Cottonwood Heights City Planning Commission.

And finally, Shyann Hugoe and Barb Tobin, who are the Community Development Grant Specialists for Salt Lake City's Fix the Bricks Program, which provides funding to Salt Lake City homeowners that live in unreinforced masonry homes to help them cover the cost of seismic retrofits.

Amanda Hertzfeld Again, my name is Amanda Hertzfeld. I'm with the city of Seattle and I am the Unreinforced Masonry program manager working to create a mandatory retrofit ordinance in the city. We'll be the first jurisdiction

outside of California to require that. And I wanted to first just thank CREW (Cascadia Region Earthquake Work Group) for doing this podcast series. I think it's a really great idea. And then I'll just throw out a thank you to NEHRP, the National Earthquake Hazards Reduction Program: that is a group composed of FEMA, the USGS (the US Geological Survey), NIST (the National Institute for—*is it Science?* standards—Standards and Technology), and the National Science Foundation as well.

So, I would like to go around and do a quick round of introductions. Maybe you can introduce yourself and tell us how you got here. Did you think that you would end up as a person with a career in earthquakes? So, let's start with Janiele and then we'll go around from there.

Janiele Maffei Hi, this is Janiele Maffei. I'm a structural engineer and I am the Chief Mitigation Officer at the California Earthquake Authority. I manage mitigation programs that include grant programs for the seismic retrofit of certain seismic vulnerabilities in single-family wood-framed structures.

Amanda Hertzfeld Thanks, Janiele. Let's go to Jessica.

Jessica Chappell My name is Jessica Chappell and I am a structural engineer working in consulting for a firm by the name of Structural Design Studio here in Salt Lake. And I've been in consulting for about 20 years. I also participate in the Utah Seismic Safety Commission. And you asked, Amanda, about how I got here. I definitely did think I'd be working with earthquakes, and I learned about structural engineering as a career in high school, and I followed a pretty direct path to my seat here in the consulting world. As for seismic safety and community resilience work, I don't think I knew there was such a risk to loss of life along the Wasatch Front, so that aspect of my career is certainly unexpected and that's why I'm here. Glad to be with you.

Amanda Hertzfeld We're glad to have you here, Jessica. Let's go to Barbara.

Barb Tobin Hello, my name is Barb Tobin and I work with Salt Lake City Corporation, and I am a grant administrator over a program that's called Fix the Bricks. And, basically, the Fix the Bricks program, what it does is we have FEMA funding and that FEMA funding provides seismic upgrades to unreinforced masonry homes. And so we do roof-to-wall attachments as well as chimney bracing within that program.

As far as ever being involved in the earthquake world, not me, I didn't anticipate that at all. I was in a previous grant program—I was a grant

administrator for a different program with Salt Lake City—and when we took over the Fix the Bricks program, part of one of the things that really made me want to apply for this position and work with it was the opportunity to get out—and you'll hear from my colleague in just one second, Shyann—but we have the opportunity to go meet with the homeowners: we meet with the homeowners, we work with the structural engineer who's under contract with the city, and we also have the opportunity to work with the contractors that actually get out and do this work. So that was very exciting to me because it gives us the opportunity to directly work with these individuals and the homeowners that are so thankful for the program. And so that is how I ended up in the earthquake world.

Amanda Hertzfeld I love that, Barb. Thanks. And Shyann, we'll go to you.

Shyann Hugoe Hello, I am Shyann Hugoe. I am with Salt Lake City Corporation. I am a grant administrator as well for the Fix the Bricks program. I definitely thought I would be in some type of earthquake job because I've got a few degrees in geology, physics, engineering, and I worked for the city while I went to school for doing all this stuff. And so when they took over this program in my department, it was just the perfect fit. And then I got to work with Barb, and we get to go out and do all the fun things she already said. So it is just perfect for us.

Amanda Hertzfeld Well, I am so happy you all are here today. It's really nice to meet all of you, and I think it's really cool that we're all women too. I think being ladies in the sciences—there's not as many of us, especially in the earthquake world, so we are representing here today.

So, I wanted to go over just a few things before we really jump into asking some questions. So, this episode's topic is on preventing earthquake damage. And for our listeners, I think we've all heard about the “big one.” And depending on where you live, the big one is different, right? So if you're in the Pacific Northwest where I'm at, our Cascadia subduction zone fault, the giant fault spanning from Canada to Northern California capable of causing, what, a magnitude 9 earthquake and tsunami. In California, you have the Hayward fault and the San Andreas fault, with more than 70 percent of the state's population residing within 30 miles of a known fault where shaking could occur in the next 30 years. And these faults are capable of producing in the magnitude 6 to 8 range. And then in Utah, where many people might not even realize there's an earthquake hazard, the Wasatch fault runs along the western flank of the Wasatch Mountains, stretching from southern Idaho all the way down through SLC,

Salt Lake City, ending in central Utah. And this fault has a 43 percent chance of producing a magnitude 6 or greater earthquake.

So all of these earthquakes are capable of displacing households, of causing significant injuries, causing hospitalizations, economic losses, and millions of tons of debris and rubble, which would require the creation of new landfills. And I think it's important to note that while these "big one" scenarios can happen, albeit very infrequently, smaller earthquakes around magnitude 5.5 or so can cause most of the occurrences of strong shaking. So just probability-wise, we're more likely to have a smaller earthquake than a larger one.

And I'll steal some language from the USGS's Sarah Minson here, but she suggests that we kind of rethink our perspective on earthquakes, and rather than focusing on these "big one" doomsday scenarios, we kind of think about a sharks-versus-cows concept. So, we know sharks are scary and cows are not, but cows kill more people than sharks do. And so we shouldn't become paralyzed by the depiction of these doomsday "sharknado" scenarios when more probable and more manageable earthquake scenarios are within our control to mitigate.

So, we're here today to talk about ways to prevent earthquake damages, because Dwayne "the Rock" Johnson is incapable of rescuing everyone, and that movie ends without diving into all the broken things: the roads, the bridges, the homes that are demolished and rebuilt. So, without further ado, let's chat with some leading ladies in earthquake risk reduction on what we know breaks in an earthquake and how to prevent it from happening before we're stranded and left waiting for "the Rock" to rescue you in a stolen government helicopter.

So with that, my first question is for Janiele, and I'm wondering if you could briefly speak to the most common types of damages that homeowners experience in an earthquake and what kind of retrofitting can be done to reduce that probability for damage?

Janiele Maffei

Well, it does vary geographically. I can say for the West Coast of the United States, the vast majority of our residential construction is wood framed. We have a little bit more mild temperature and lots of access to timber, of course. In the center of the country, of course, and going back east, of course, you see a lot of unreinforced masonry, which can be very, very serious. But as a California structural engineer managing mitigation programs in California, we worked with FEMA to create a document that identified the top four vulnerabilities in single-family wood-frame

dwellings. And so that would really qualify for the whole west coast. And from the simplest, it's the unreinforced masonry chimney: those just topple in even the most moderate of earthquakes, can be very damaging, and not only can they be damaged themselves, they can really increase damage to a house.

The second is the most common, is that the house is just older, and so it was constructed before building codes really were as advanced as they are now, and the house is not properly anchored to its foundation, and it has a crawl space under it, but it's not braced. And so that's a really pretty easy thing to retrofit with bolts and plywood.

The next one that we find—and I always say to people, if you've been to San Francisco, you know what this looks like—it's the single-family soft-story house. So, with the introduction of the automobile, we took out all the elements that resist earthquake forces, which are walls. We put in a great big, giant open garage on the first floor, and that big garage door took out the elements. And so, we call that a soft-story single-family.

And then the most dangerous—fortunately, not the most common—is the hillside home that isn't properly anchored and is missing some of those other elements, the appropriate walls, the appropriate bracing.

So, there's the top four in wood-frame; and then of course the unreinforced masonry is very significant and dangerous—a little different animal though in terms of retrofitting.

Amanda Hertzfeld Thanks, Janiele. So, I'm going to hand it over to Jessica. And so Jessica, I know Salt Lake is focusing on primarily URMs, but you do have some of these older single-family wood-frame homes that are in need of bracing and bolting. And so I'm wondering if you can tell us: If you're a homeowner, how do you learn whether your home is in need of a retrofit and who do they go to? What type of questions should they ask? What's the subject-matter expert they should be hiring?

Jessica Chappell Okay, great. Yeah, I think really quickly, I just wanted to note, yes, we might see some of these same deficiencies that Janiele has just listed here in Utah, but the reason we have unreinforced masonry, or so many unreinforced masonry buildings—estimated anywhere from over 120,000 of these buildings, many of which are single family homes—that comes largely out of a code adoption or maybe just not an adequate recognition of the high level of seismicity that we have in the Wasatch Front region due to the fact that the recurrence of our earthquakes is very low. So we had adoption of a code that prohibited the use of

unreinforced masonry in 1975 or '76, but we have a very long transitional period for unreinforced masonry. You start to see reinforcement being used by various structural engineers and builders in the mid-fifties, it gets really pretty common by the mid-sixties.

So, I would say to a homeowner, the best place to start is to take a look at the parcel history that should be listed as public information on your home. If it is listed as a brick structure before the mid-sixties, it is worth-, you'll have a high likelihood of having unreinforced masonry. That unreinforced masonry can occur in two common forms. In some of our very charming turn-of-the-century bungalows, you can see header courses of clay masonry where those bricks are turned 90 degrees to interlock layers of clay masonry. But one that might be a little harder to discover is a home that might have a traditional brick veneer without those header courses that's backed by an unreinforced concrete masonry unit wall. And so that's really something that's unique to Utah. There's just a prevalence of those types of structures in our community, and a lot of them are made up of six-inch concrete masonry wall.

So, if you know you have header courses in your wall, you know you have URM. If you know you have six-inch concrete masonry units behind your brick veneer, you know you have URM. If it's a little harder to perceive those structural systems, I would recommend going to a licensed structural engineer, preferably someone with experience in existing structures. Engineers are very creative. They know which parts of the attic to crawl into and what you can see from an open space from your connection. Here in Utah, we have a lot of basements, so when you see that connection from a foundation wall (or, worse, a rubble stone wall that forms your basement foundation wall) to what's above, it can tell you a lot about your structure.

Amanda Hertzfeld And how difficult are these retrofits to complete? What kind of disruption is caused?

Jessica Chappell So the short answer is, it depends. Single-story projects will be more straightforward than multi-level or two-story projects. And then, when it comes down to the level of complexity, really where those bearing walls exist matters. For instance, if all of your walls and your structural elements occur in open living spaces or bedrooms, there are fewer finishes to disrupt to access those walls, to tie those roofs to floors, or to add additional wall elements if necessary. That would be your more significant retrofit. But for instance, if those elements occur behind kitchen cabinets, that's a significant effort to both remove and replace

those items. So, kitchens and bathrooms can add those complexities to the project.

Amanda Hertzfeld And my last two questions is, how long does it normally take to do those retrofits, and are there any mistakes that homeowners tend to make when they decide to retrofit?

Jessica Chappell Okay. So, I would say, again, these are dependent on the complexity of the building itself, and then whether you've got some good luck on where those elements need to be accessed from with your finished spaces. So, given current construction pressures, I would say for a fairly straightforward single-story home where we're just connecting up our roof elements to the walls, I would say, just looking at like a three-month minimum. Just set yourself up for not being disappointed because, again, right now our builders are just really—, they're full. Then, if we're looking at a more significant seismic retrofit, we're talking about over a year.

Common mistakes or pitfalls—I would probably say scope creep. As you can imagine, once you start opening up that house, you're removing items. If you have a plan to change out cabinets or do any kind of remodeling that way, there are some efficiencies to going at multiple projects at once. A re-roof would be a great example. If you're planning on re-roofing, that's the best time to access your roof-to-wall connections—it gives you a lot of flexibility. So, by combining projects, if you're lucky enough to have the ability to do multiple projects, doing them at the same time can offer some more options to your contractors on construction methods and also help with sequencing.

Amanda Hertzfeld Thanks, Jessica. I wanted to just call out two things that you said. You mentioned flexibility and you mentioned connections, and I think for the general public, when you're thinking about what an earthquake does to a structure, the connections are what's really important, and I am not an engineer. My background is in planning. And I'm a little bit of a rock nerd not licensed, so I oversimplify things frequently. But I always like to think of the retrofitting of a structure as kind of being like that skeleton-bone song: your knee bone is connected to your leg bone; your leg bone is connected to the foot bone. Your skeleton is really weak if things aren't connected. And so putting your roof and walls together, making sure that your walls and your foundation are connected, are really important so that that structure has flexibility in an earthquake without collapsing.

Jessica Chappell I think that's great. I might take a first pass and then let Janiele add her two cents.' But I think it is great that—, Amanda, to bring it back to the basics. A lot of engineers will tell you, you can look at everything like it's a beam, right? So the roof is a beam rolled horizontal, and it is going to connect all of your vertical elements to one another. And so the term that we love as structural engineers is "load path." We need to make sure that anything that wants to happen at the roof can make its way all the way down through the foundations to the dirt below. You're absolutely right, we are looking at strong connections from a roof element to a wall element, from a floor element to a wall element, from a wall element to a foundation element.

Amanda Hertzfeld Janiele, I see your hand is up.

Janiele Maffei Yeah, I love the description. I use that song, the head bones connected to the neck bone. (I don't even know if I know the song correctly.) I love that to describe load path. Just the good news for the person who has the wood-framed house is that the retrofits can be very, very simple. The earthquake brace-and-bolt retrofit of your crawlspace can be done by a contractor in about two to three days, and on average in California is about \$5,500. So that retrofit is significantly less work and less money and less time, obviously, than an unreinforced masonry retrofit. Also, we have plan sets that have been developed that are about to be adopted into the building code, that can be utilized by an owner builder or a contractor without an engineer. They're essentially pre-engineered. So that's the good news for the owners of the wood-framed houses. It's certainly a much less intrusive and expensive effort.

Amanda Hertzfeld Thanks. That's a really good point, Janiele. So, \$5,500 in California for a wood-frame house, to brace and bolt to the foundation, sounds a lot cheaper than having your home slide off of its foundation in an earthquake, which won't kill you most likely, but the cost of things afterwards to repair and fix might make you wish that it had, right? So, I'm curious, Jessica, how much are we talking for a cost of a URM home retrofit in Utah?

Jessica Chappell I spent some time on this question, because frankly, I have never been a consultant on a retrofitted unreinforced masonry home. But in speaking with some folks who've gone maybe just through a schematic-level look at their unreinforced masonry home, and looking at trying to get it to a code-level retrofit, they were looking at just shy of \$5/square foot for a pretty light touch retrofit, right? We're talking about removing finishes every four feet to connect up those roof trusses to the walls. Of course,

the devil is in the detailing on that, but again, if we're looking at a more robust retrofit that might require new shear walls or new steel braces, something more invasive of that nature, we could be looking at upwards of \$30/square foot, and then, of course, put-back of those finishes can vary significantly. So, I did—, maybe, to kick it over to our Fix the Bricks team, I know, again, they are with that program, with bracing the chimneys and the roof-to-wall connections, we saw some very clear evidence of success in those structures after the Magna 2020 earthquake, which was a magnitude 5.7 event and had significant shaking across Salt Lake County.

But again, that is going to be those elements that are really going to help us on the smaller, more frequent earthquakes. So, I actually was curious about average cost of those projects, if that's something that can be shared as well.

Barb Tobin

Certainly, if you want me to answer now. So, as you stated, Jessica, it just depends, right? A lot of our URMs—or unreinforced masonry homes—they are prior to 1975. I mean, we see homes as old as— . . . I did site visits last week: the homes were built in 1895, right? So, they're old. So, our contractors, when they go in, they can look on the outside, but once they open it up, they're not exactly sure what they're going to run into. So, like you said, there are times that they need to build shear walls, especially on the gable ends, and things like that.

But what our retrofit does, is it adheres the roof to the wall, right? So, they peel back the roof so that they can get to the point where the roof and the wall line up, and then they insert what's called helical pins. And these helical pins are drilled into the masonry, they're folded over, and then they're reinforced, and then all of that is pulled back. So, they do that on the perimeter of all the masonry walls, and then they also brace the chimneys. That is what our retrofit is going to entail, and we have seen them—. So, Shyann and I have had the program for a little bit over a year now. Prior to that, it was in another city department. So, in this last year—and Shyann can correct me if I'm wrong—we see on average they range from about \$18,000 to \$30,000. And I think the most expensive one we've seen was \$38,000, was it? I think it was about \$38,000, huh Shyann? That particular home had several mason gables, right? The eight gable ends (gosh, I apologize) were masonry, so, they had to build shear walls and such. So given all that, so you figure they're peeling it back, they're putting in the helical pins, they're replacing the sheathing, they're replacing the shingles; some chimneys require two and three braces if they're really tall, some homes have more than one chimney—so yeah, I'd say they

range between about \$18,000 and \$30,000, is what our retrofits generally run.

Shyann Hugoe I am going to just correct Barbara a little bit: I have seen on some of the—because in Salt Lake City, sometimes we have some particularly small homes, and then average size homes, and sometimes large homes—so in some of these very particularly small homes that are kind of simple with not too many gable ends, it's not too much of a pitch in the roof or anything, some of them are coming in as low as \$13,000, \$14,000. So, sometimes we see them a little bit cheaper than \$18,000, but that could be just a distinction within the super dense city, of where we've got some of those very much smaller homes.

Amanda Hertzfeld And I'm going to ask a question. How much does Brace + Bolt reimburse for this type of work?

Janiele Maffei Sorry?

Amanda Hertzfeld Sorry, I guess I meant—I said Brace + Bolt, and I meant Fix the Bricks.

Janiele Maffei Oh, Fix the Bricks. Okay.

Amanda Hertzfeld Sorry about that. Sorry.

Barb Tobin So the way that Fix the Bricks works: it's a FEMA grant. So, FEMA will cover 75 percent of the retrofit, and the homeowner is responsible for 25 percent—a little bit, yeah. So, there is one other city program that is available. I do believe that we might hit on that a little bit later in the discussion. But yeah, so it's a 75/25 split between FEMA—, so the homeowners are coming up with between \$3,000 and \$8,000 depending on how extensive the job is for the project.

Amanda Hertzfeld That's pretty reasonable. That's great to hear, Barb. Janiele, did you want to say how much Brace + Bolt covers, since we started that?

Janiele Maffei Yes. So, earthquake Brace + Bolt provides a flat up-to-\$3,000 grant for the typical homeowner. We're very excited that a year and a half ago, we were able to introduce a supplementary grant for income-qualifying homeowners. So, if they have a household income of \$72,080 or less, we'll give them a second check: essentially, then, in most cases, we'll pay for the entire retrofit. So once again, we're able to do this—, the costs are significantly less. As we go to our more expensive retrofits, for example, our soft-story: those can be up to as much as \$27,000, \$30,000. We are doing a percentage of the retrofit as well as our maximum; and then hopefully someday, when we're in multifamily, we'll have a whole other

percentage. But I think that one will also require a match by the building owner.

Amanda Hertzfeld Thanks, Janiele. Yeah, it's so great to see that these programs exist. I mean, just as a homeowner, to undertake these by yourself, that's a lot of money; and so having funding available through FEMA grants is really a great way to help both promote equity and that everyone should be able to have an earthquake-ready home. But to help with that communication of, "This is a thing that your home likely needs," as well. Jessica, I see your hand is up.

Jessica Chappell Yeah. Is it okay if I ask a follow up question on the Fix the Bricks? Okay. I was curious: on the projects where additional shear walls are added for gable end, is that actually covered in the FEMA grant program as well, those additional walls?

Barb Tobin Oh yeah. So actually, like I mentioned, we took the program over about a year and three months ago, so that is actually an amendment in our scope of work that we got from FEMA. When we initially took the program over, it was just the roof-to-wall and the chimney bracing. However, we were finding that as the contractors were opening up the homes, they were saying—, because I believe the thought process behind it is, if we don't shear up these gable ends, then—I don't want to say, "Is it not worth it;" probably a better way to say it than that, but, it's not complete, right? We're not going roof to foundation, so we're just going roof to wall. So, to make that as stable as possible, we reached out to FEMA, and we did get a scope-of-work change approved. So, they are covered in our particular grant.

Jessica Chappell That's great news. You have to have something to connect to, right? So wonderful. Thank you.

Barb Tobin Shyann has such a great background with her engineering, and to some degree, I feel like the little rookie sometimes, like, "Hey, Shai"—because I think she understands that portion of stuff better than I do. But I will say I have learned so much, because when we first took the program over, I'm like, URM, what the heck? What are you talking about? What do you mean the roof is just sitting on the walls? What? By gravity? And so, I know she's learned as well, but I feel like I've learned even more. And the contractors, we feel super blessed because, once again, when we took the program over, there was pretty—, primarily one contractor, and we have five coming out to all of our pre-bids now. So, we have a super great number that are coming out and participating. And they are so great because

they allow us to ask them questions as well—"Hey, well when you're looking at this . . .," and then, when we do the site visits with the structural engineer, "Hey, what about this?" And so, you learn to start looking at the gable walls and seeing if the masonry is going all the way up and how new is the roof. And so I believe there's a lot of feedback and a lot of information that we are able to provide to the homeowners so that they're going in with their eyes as wide open as possible so they truly know what is being done to their home; and to let them know this is a life-safety program, and we want you to be able to grab your loved ones, whether your loved one is a kitty or a doggy, or if it's another little human or whatever it is, so that they can be safe in a seismic event.

Amanda Hertzfeld I picked up on a few words there. I heard life-safety a few times, and Barb, I love how you get to talk one-on-one with the homeowner and that your contractors are so open to answering questions, and it just seems like a really positive environment. How are you communicating the concept of performance to your homeowners? And I ask this because this is something we're grappling with in Seattle. So, we're creating a minimum seismic standard for the retrofit of URMs that is very much a collapse prevention. And I think a lot of people assume, I think they think that the building code in general is higher than life-safety anyways. And this is starting to touch on some engineering technical terms, but generally, building code for new buildings is life-safety, and if you want the building to be functional after an earthquake, there's more engineering that needs to go into it. You're building higher than code levels. And I know, as a non-engineer, it took me a while to grasp that. So, I'm curious, Barb, when you're talking to people and you're saying, we're asking you to make an investment in your home for the seismic retrofit of your house . . . by the way, are you still going to have damage in an earthquake; or how are you explaining that to them?

Barb Tobin First of all, most of the people that we work with, they've waited quite a while to get these retrofits done, so they're super excited when we finally show up on their doorstep. And so, the very first thing we do with all of our homeowners is we have what's called a site visit, and we go through and we kind of explain every detail of the program. But I think that's one of the very first things that Shyann and I like to convey to all of our homeowners, is the fact that this is a life—I mean, that's exactly what we tell them—this is a life-safety program. We would love to save your home. We would love to go roof to wall. And we let them know there are absolutely more extensive upgrades that can be done; however—that's the little however that we give them: that FEMA wants to be able to touch as many

homeowners as they can. So, by doing the roof-to-wall, we can really stretch those FEMA dollars even more, so, because-, the analogy that I like to give them is, right now if there's an earthquake—and, I mean we're pretty open, and I don't want to say graphic with them—but we tell them, in an earthquake, your walls are going to go out and your roof is going to come in. Those are the chances. However, if we do those roof-to-wall attachments and we brace that chimney, well, now your home is moving in tandem, right? So, we're moving together and, like I said once again, and, I mean, if I see littles around or if I see doggie or kitties or whatever, I'm like, it gives you that time so that you can grab everybody up and all of you can be safe. And once again, we get to that life-safety factor. Shai, did you want to add?

Shyann Hugoe Yeah, I'll just tag onto what Barb said. So, I mean, we are incredibly lucky where we get to go out and have these site visits, so we get to have face-to-face communication with these homeowners. So, when it gets to some of this technical stuff, you can just really, I mean, when you have a face-to-face conversation, somebody can really meet these folks where they're at. So, I mean, you don't have to tell them the very specific details that you'll get from your stamped engineering drawings about how they'll be placing this helical pin in the roof. But you can, I mean, once you understand the concept, you can explain it a lot better. You can just use different terms that aren't quite so technical. Actually, when I carry on my backpack, when I'm going out to these, I keep a helical pin in my backpack, and I'll pull it out, using visuals helps, and I'll pull it out and show it to them and explain that-, explain to them exactly how it works. So, I just really think we're super lucky by getting to have these face-to-face conversations, because you can just really meet folks where they're at and talk about it until everybody's comfortable with the communication that's happening about the work to be done.

Amanda Hertzfeld Do you have any advice for or best practices for talking about these kinds of concepts with non-English speakers or English as the second language?

Shyann Hugoe Yep. My advice is, I send Barb.

Barb Tobin Fortunately, I am bilingual, and so Spanish is definitely my second language. I mean, I've learned it as I've gotten older. So maybe the good part of that is I couldn't technically tell them what we're doing anyway. I couldn't be like all super technical, so it would just be a matter of explaining to them, literally explaining to them. Shai and I are fortunate in that I do speak Spanish; however, our department that we work with—I

happen to be one of the people that they come to when they need things translated—but we make a very big effort to make sure that our Spanish-speaking community is given the materials that they need in the languages that they need. Now, in the year and something Shyann and I have done it, I have yet to have a Spanish speaker.

However, if we ever needed to, I would be able to do that. And we have two other people within our office that also speak Spanish. So, let's pretend one day I wasn't around or whatever. Then Shyann could certainly turn to one of them to help her through it. But it is a big effort that we make, and I'm sure everyone does, right? Because I mean, really, it's hard enough to kind of understand in English, let alone if you're a Spanish speaker, trying to pick up on it and understand. So we are fortunate in that sense.

Amanda Hertzfeld Janiele, what about you? How have you mastered that?

Janiele Maffei Yes, so our program is a little bit different in that we've now retrofitted over 22,600 houses, and we have about a thousand contractors on our directory. So, the scale is obviously bigger. Once again, just a little different program. It's just so common in California to have this problem. So, because the scale is bigger, though, we can utilize mass media, we can utilize television and radio and print, and we've gotten great cooperation from, particularly Chinese and Spanish media, radio, television, print—and so they've been fantastic. And also, because there's so many people now who have been retrofitted, we have what I consider to be social—what's it called?—social capital. Social capital, in that people hear about our program from their friends, their neighbors, their relatives, their real estate agent. That's the most exciting one. So, they're hearing it from people that they trust, which is really important.

We learned very early on that when we first went into a community giving money away, they go, "Who are these guys? What do they want to sell us?" And so, by working with people who are in the community, to have them really understand that they have this vulnerability, they should do something about it, has just been really successful for us. We also utilize translation services with our customer service folks so they can contact—, just about any language can be provided through those translation services.

But the other thing is, I love the fact that you have contact with the homeowners. That's my very favorite part, and I really missed during the pandemic being able to do personal in-person presentations throughout

communities. That's where not only do you convey information, but the most important part is, you're listening. You're listening, you hear what their questions are so that you can tailor the program to the people who need it the most.

So, with regards to the benefit, the cost-benefit, we actually worked with the Pacific Earthquake Engineering Research Institute—that's a number of universities throughout California—to quantify what exactly are the savings to retrofit the earthquake brace-and-bolt house. And it's really interesting, because I think all of you know that the probabilistic nature of earthquakes is a little difficult. So, what we did is, we took some scenario earthquakes that were not the "big one," but rather, the more likely one, the design-based earthquake—so, for example, the 7.0 in San Francisco. We said, "Hey, the worst performing house, the two-story house with wood siding, can have hundreds of thousands of dollars' worth of savings if you do this \$5,000 to \$10,000 retrofit. And so that information—, we had social scientists working with us on that project to develop our language to be able to convey that information to people. So language is so important. Even the English part, of course, is hard to convey; a high-consequence, low-probability event is so difficult. But it is so important to be able to have people hear that in their first language, so fantastic that you're there for them, and with—, you're bilingual— (My Spanish, unfortunately is, I think, about the level of my two year old daughter, I mean granddaughter, granddaughter.) So very, very important though.

Jessica Chappell If I can chime in there. I definitely think, Janiele, as you were talking about the cachet of having that brace and bolts retrofit, I happened to be sitting next door to someone who did that to their Oakland home years ago. But I definitely see it here, especially following the Magna Earthquake, really some—I would characterize it as jealousy—from folks that are just outside those Salt Lake City boundaries. And so, I think the more I've learned about the California Earthquake Authority, clearly just a really great organization, and you guys are doing so much good work that we're trying to learn from here in our communities, but we are doing this all on shoestring budgets, largely with that help from FEMA. And as we're trying to build that momentum, we just have to take every win we can. And so I'm so thankful for the work that Barb and Shyann are doing. We definitely see it making a difference in the understanding of the communities around Salt Lake City.

Janiele Maffei I wanted to add one thing: That is with the ArcGIS capabilities, these graphics that you can do, it is so wonderful to be able (we track every EBB house) to pull up the zip codes that we were in in 2013 when we

started, and to see the dots grow. We have different colors for each year, and, as I said, they're hearing about it from their neighbors. They're starting to socialize that this is what they need to do. The other thing is that there was a paper written by a professor who was formerly at University of Colorado that said that they used Zillow data, and for houses that had listed in the MLS that the house had been retrofitted, they saw an increase of 17 percent in the sale price. So that's where we want to get, is that socialization that when somebody in Salt Lake City sees this beautiful house they fall in love with, sees those, as you said, the coursework that's telling them that it's unreinforced masonry, knows that, "Oh yeah, I've heard about that and I know it's going to cost me about this much." And that starts to become part of that transaction and part of that touch point that we have with them when they buy a house.

Amanda Hertzfeld This is a tricky question, and Janiele, we don't have to answer this. It wasn't pre-scripted, but I'm just curious. Both of these programs are very much targeted at the homeowner. What about renters or tenants of these buildings? So, your awareness materials have worked. They know that their building is vulnerable, but they don't own the building.

Janiele Maffei Some of our most vulnerable populations are renters, and we know that; and we know that in California, it's just under 50 percent of our residents are renters. And we also know from statistics that many renters live in older structures, and as our colleagues from Salt Lake City mentioned, there are benchmark dates for all of these, and typically it's the older house that has the most vulnerability. In our enabling legislation that created the mitigation program, they said "owner-occupied." And I think the reason was, "Let's not give money to large corporations that have large portfolios." And so, we've been dealing with that language, because we want to change that. We want to start to do rental houses. It will be a very different sell, though, because that is all going to be all about return on investment. Now, the good news is, we do have these studies. We have the 17 percent in terms of sale price. We have the hundreds of thousands of dollars in savings. But once again: low probability event. So, we're going to have to utilize our marketing and our communication consultants to help us find the right language to sell that to the building owner.

I know that you can find publicly available information that tells you if a building owner owns a certain number of houses, so we can deal with that number of houses. We can say, "Hey, if you have a portfolio of five or less houses, you qualify." And then I really do hope that we'll be able to make a difference in that rental market as well. And then, of course, if we

do have the opportunity to move into the multifamily-retrofits space, of course, that's all about renters. Then the difficulty becomes, you would like to focus on the socially vulnerable. So how do you figure that out? If you just use geography, you miss owners who have lots and lots of income-qualifying renters in their buildings, but it's very difficult for a building owner to get financial information from their tenants to qualify for a program: all challenges, not deal breakers. But a really important thing that we need to do is to move into that rental market.

Barb Tobin

Amanda, if you don't mind me just chiming in real quickly: So a lot of what Shyann and I do, right, it's contingent on the scope of work that was written into our grants with FEMA. However, the exciting thing is with our—, so initially, they were called PDM grants—the pre-disaster mitigation grants—and now it's the BRIC application. So, as we submitted the BRIC application for this last year, which I believe we find out in August, and then we are currently working on the current BRIC application—we have now included multifamily in our BRIC application. So, for this last year, I believe we applied for 150 single-family and 25 multifamily. And it may not sound like much, but you start somewhere. And so, we have 25, and we will find out in August if we received funding for that. So, we're trying to get into the realm of starting to add those multifamily homes to the homes that we start to retrofit, because, if we're talking life-safety, if they're rentals, if they're multifamily, there's even more people. And every life is important, regardless if it's single family, multifamily, whichever. But if we can start moving into that realm, we can pull even more people in—like our vulnerable renters, as Janiele mentioned, right? Keep them safe as well. So that's exciting for us. We're working on that and we're crossing our fingers for the next round of funding.

Shyann Hugoe

Salt Lake City is a very interesting community that we live in. We're—, it's a very tight community, and we actually do deal with quite a few landlords, even just in the single-family homes. There is quite—, we do have quite—, I don't think we're at the 50 percent like California is, by any means, but we do have quite a bit of the investment properties around here. And we work with investors on these single-family homes quite regularly. And I only know that because I have to coordinate with tenants sometimes about when we're coming out to do site visits or pre-bids to take a look at the house. And so, I would almost say, maybe anywhere from 8 to 10 percent of the projects that we've worked on in the past, a little over a year, have been investment properties.

Amanda Hertzfeld

That is so interesting, and it's really neat to see the evolution of these programs. Salt Lake City' Fix the Bricks is pretty new. California, your Brace

+ Bolt has been around for a while. But you're shifting into different types of vulnerable structures. And there's so much jealousy from my seat over here in Seattle, but I'm also over here scrambling, taking notes.

But I'm curious, how did these programs get started? These are high-consequence, low-probability events. These are really complicated grant applications. It's really competitive. How did you get these programs started? What or who prompted the creation of them? And let's start with you, Janiele.

Janiele Maffei

Yeah, so ours is very, very unique in that (to try and do this as quickly as I can) it all comes back to 1984, when the state of California separated earthquake insurance from the insurance policy for single family residences, but created the mandatory offer law that said, If you write a homeowner's policy in California, you must offer earthquake insurance. So, we had huge take-up. Modeling was in its infancy—they really didn't understand their overall risk. And the Northridge earthquake happened, and they lost their shirts. The insurance companies said, "Whoa, with this mandatory offer, we're not going to write policies in California. In fact, many of us are just going to pull right out. We're going to pull out of California." And so there was a huge crisis. There was, like, \$40 billion in damage—half of that residential, half of that insured, and they'd had no idea that's what they were on the hook for.

So, the legislature stepped in to create the California Earthquake Authority: not an agency, but a unique instrumentality of the state created by legislation. And so, in the insurance code is a description of who we are, what we do. Mitigation was part of that from day one. They wanted us to do mitigation—not only transfer risk, but reduce it. So they said, you must take 5 percent of your investment income and put it towards mitigation every year. So, it's about \$5 million today comes to our mitigation program. Now, the good news is, that's coming from policyholders. Policyholders get something back for that, in that, with that outwardly facing program, we don't have to pay taxes on their premiums. So, they, way above \$5 million a year, are benefiting from that. But the state is benefiting from this mitigation program. So, with that legislation—that said, "We want you to do incentive programs, grants," so we were all lined up ready to go.

I joined in 2011. They had to pass a law to create my position, and I had about \$25 million. We knew the way to go was to leverage that with FEMA funding. That's what we've been able to do. State funding is there as well, but a little bit more tricky. It comes with more strings, and state funding is

taxable at the federal level, whereas FEMA funding is a Stafford Act. So there is legislation pending right now at the federal level to make these grants not taxable. And I certainly hope that happens because this dance, when we use state funding that's taxable and federal funding that's not, is crazy. But that's how we started: created by the state of California, given full support, we've gotten some state funding, where we've had great success with that FEMA funding.

Amanda Hertzfeld That's great. And what about Fix the Bricks in Utah? How did that get started?

Barb Tobin So, I knew this question was a coming, and so once again, I'm going to say, we've had the program for a year and a couple of months, so we were not involved in the program in its inception. So, I reached out to someone, and, unfortunately, he wasn't able to get back with me before we were meeting today.

I did look up some brief history on the program. I do know that it was in 2016 that Fix the Bricks was instituted. That was the first year that we received funding. If I can make an educated guess here (and actually it's not a guess, it is in writing), and I'm going to scroll over to my little . . . the information that I found was, it looks like there's probably around 30,000 brick homes in Salt Lake City, but it says that there are over 144,000 URMs scattered across all of Salt Lake City. Jessica, I don't know if you have any numbers or whatever, but that's the number that was in there. So, I'm guessing that, because of the large number of unreinforced masonry homes and the fact that we are on fault lines and such, it really prompted city leadership to move forward to apply for this awesome funding through FEMA. Jessica, I don't know if you have any further details on it.

Jessica Chappell I can offer what I know. I think the 144,000 is maybe a higher-end estimate, but I think you're definitely in the ballpark. I think anybody who even wants to bring it down, I think 130,000 is the small-end number. So, it's a significant number. And the program itself is, again, it's an incremental improvement to these structures, and it's based off a guide that was written, I believe, with another FEMA grant back in the '90s— it happened to be written by some of my former colleagues at Reaveley Engineers through a FEMA grant that was applied through the state. And so, the guide itself was intended to be kind of a DIY to help people make these improvements. So, it had been in the community for a while—every once in a while, somebody will so excitedly tell me they've got a copy of it and spiral bound—and so it really was something that was around.

They realized that people needed a little bit more help, I believe, so I think it was a partnership with the state and the city as they looked at “how can we help people actually implement these processes?” And I believe that’s when the grant process started. So pretty exciting stuff. And I know there’s a lot of efforts to bring a little bit more muscle to this program in multiple directions: one is to revisit that guide and offer some upgrade, some newer technology and detailing to the program itself; then, the other piece is, the state is actively pursuing—looking at—rolling this program out statewide. We do have a high risk in the Wasatch Front region, but even in St. George, we have regular earthquakes in the southern part of the state near all of the national parks that everybody loves. So, there’s a lot of good work going to build on what Salt Lake City has been doing since inception of this program, so it’s very exciting.

Barb Tobin

And actually, I’m glad you mentioned that, Jessica, because I just heard from the state representative the other day, because when we took the program over, we had been in contact with him to find out when the new URM guide was going to be coming out, and I think we’re probably close, because he called me the other day, and we’re just playing phone tag. And then as far as the state’s program, Shyann and I and our team actually met with—they’re doing a feasibility report to do a statewide program—and so we have met with them, and I know they’re currently working on that to hopefully get the program broader than just the Salt Lake City area, because there’s a need for it everywhere. Awesome. Jessica, thank you so much.

Amanda Hertzfeld

This is wonderful. And it’s prompting another question, so I’m going a bit out of order, but the Fix the Bricks program in Salt Lake, currently Salt Lake only, but with plans to go statewide. That’s great. And that’s without any mandatory legislation in the state saying that these buildings have to be retrofitted.

California has had various levels of mandatory versus voluntary retrofit programs, and your program has been around for a while, but you’re the only state that has a statewide retrofit program. And so for all of you, I’m curious for our listeners in other states, or for your guest host who is trying to create a program, what advice do you have for creating or building the support to create this type of program? Is there a certain political level or office or agency that should be supporting and advocating for these programs? Who has been a real champion to help your program become successful?

Janiele Maffei

So in California, we have the California Seismic Safety Commission that really took a lot of responsibility to help with the background information for the unreinforced masonry. In many cases, it takes political—what's the word?—political boldness and far-reaching and far-looking people, people who are above and beyond their colleagues in understanding. I think we all know that most of our representatives, they have two-year terms. They have to have quick hits and quick wins. And we are in the business of slow. We're not the hare, we're the tortoise. And so when you have these people who stand up and understand that these decisions need to be made, you grab onto them and run with them and give them all the information that they can.

So, we've had more earthquakes obviously, than all of you; we've had quite a spell of very few earthquakes, and outside of urban areas, since 1994 Northridge. But up to that, you know, 1906. And so, with every earthquake, something happened: 1933 schools—unreinforced masonry schools—would've killed hundreds of people. A law came into effect. 1971 earthquake damage to hospitals created the Seismic Safety Act for hospitals. It took 30 years to get a program where we had mandatory retrofits. So once again, slow-but-steady, with political leadership, is very, very important.

So the Seismic Safety Commission is there to provide support. They have people who are representing all industries who are part of that organization, and structural engineers who provide them with technical. Our organization in the residential sphere is able to push. But I will tell you that all residential retrofits in the single-family realm are voluntary. I think that—, I will tell you that I believe that the unreinforced masonry—, pardon me, the multifamily retrofit program in San Francisco, which was really the first large city that did it, it took them 10 years—the CAPSS program took 10 years—working with the community, talking about this, and they were based on damage they saw in Northridge in 1994. So, slow but steady. But you start that clock and you start to work on that. And what they told—, people who were in these meetings said, “Okay, we have to do this as an owner. I'll do it. It's going to be painful, I'll do it, but make sure that you make everybody do it so that you even out the renter—, or the building-owner playing field.” So, politically, bold leadership, with the technical community standing right behind ready to give support and step in to give information. That's how California's been doing it. I know it seems like we're way, way far ahead. When we look at it, we see an awful lot that we have to do. But you've got to start that clock, because it takes,

as you all know, it takes that continual working on something for a number of years to make any progress.

Jessica Chappell And I might chime in there as a member of the Utah Seismic Safety Commission. The state of Utah is considerably different in many ways: We have a smaller population. We have a smaller geographic area. We have a much longer recurrence interval between our earthquakes. Luckily, we have never seen a fatality in our major earthquakes, which we have seen earthquakes in the upper magnitude 6 and 7 (low sevens), but they have been in, largely, rural areas. And what I see when I look at this, as a frustrated volunteer on the Utah Seismic Safety Commission, is a correlation between dramatic bold action and a body count. There have been some significant tragedies in some other states that we haven't seen in Utah. Now that doesn't mean I think we need to wait. I certainly don't think that. And so, if I may say it, in a "don't-regulate-me" state like Utah, a mandate would just be a political death sentence for an elected official here.

And so we are left to persuasion, and partnership, relationship-building. And the Utah Seismic Safety Commission—I believe, Barb, you were referencing John Crofts, who is our earthquake program manager. He is our one state employee that's specifically tasked to worry about earthquakes, right? That's *one* person at the state level, and he does a wonderful job. He has moved some mountains on some projects that I've worked with him on. But that's not a lot of support, so the Utah Seismic Safety Commission has been partnering with a stakeholder engagement entity by the name of Envision Utah. And what we're doing is combining the technical knowledge and support that we have on the Seismic Safety Commission with this longstanding community relationship with local industry and interest groups. And so slowly but surely, we're building on conversations and successes, utilizing our partners' skills, and communication and delivering the message. Sometimes we technical folks fall short, and so we have made a good partnership, and I'm optimistic that we will continue to gain traction, but it is a very, very slow process. I relate to that tortoise analogy.

Janiele Maffei Jessica, you just reminded me of something: I mentioned the CAPSS program, which is San Francisco's residential focus on what they needed to do. That took 10 years. And one of the realizations that they made, and this goes back to that whole renter percentage in California, is that 60 percent of the residents of San Francisco were renters. And renters make up a variety—, It's a spectrum of who they are: we've got the very vulnerable renter who really needs us to be assisting them in making

sure that their housing is resilient; and then, in the San Francisco Bay area now, and particularly now after the pandemic, we have got the tech worker. The tech worker doesn't have to stick around if there's no housing for them, they can up and move. They are transient. They can get a job anywhere. They can work anywhere. And so the dynamics of the residential demographic in California are really playing into, I think, some of these ordinances—that people are realizing that if we don't have housing for this very, very important workforce as well as to protect our vulnerable community, then we're in a world of hurt.

Barb Tobin

Amanda—and I do realize that Shyann and I, we work in the capital city: we work in the metropolitan city of Salt Lake—however, our city council and our mayor, they have a very vested interest in Fix the Bricks, and we report to them a lot our numbers and just—, I don't know if we're going to necessarily get to this question, so I'm just going to throw it out here now. But the way we handle Fix the Bricks is, it is “first come, first served.” The very first people that applied are the ones that we are hitting first. However, we have a program similar to you, Janiele: our city council appropriated \$84,000 towards homeowner-match. So that, however, is income-based. You have to be low- to moderate-income. So as long as you are at or below 100% AMI, the area median income, your 25 percent will be covered.

So then that retrofit is not coming out of the homeowner's pocket at all. So, to me, that shows how vested our city council and mayor are in the program. And so even if it starts at that level that you start, you have your constituents or whomever starting to say, “Hey, my council member, we're concerned about this; we're concerned about that,” to try and start getting the ball rolling.

And we are a sub-recipient to the state, who is a sub-recipient to FEMA, so we go to the Utah Division of Emergency Management—so, I know sometimes when Shyann and I have inquiries from people, we refer them to the Department of Emergency Management, the state, because they're the ones that are also looking into the statewide program. But I'm thinking you can even start at the level of just your local government, your local—, and my other suggestion is, Shyann and I have learned a lot of stuff dissecting through this and getting the program running and such, and if someone is interested in a program, or even if you're not in the same state, even if you're not, I would reach out to people in California or like us here in Salt Lake now that we have these programs, because there's a lot that we've learned by trial and error and figuring things out, and we can certainly give a piece of advice, going “Hey, I'd

really make sure this is in order before you do that.” Just because in the long run, it’s going to save you a lot if it comes to procurement or securing funds or serving that low- to moderate-income population. Right now, it’s “first come, first serve,” the way we’re handling our FEMA recipients, but that may change come-, in a few years. But anyway, that’s my thoughts.

Amanda Hertzfeld Yeah, that’s really interesting. Thanks, Barb.

So, I know we’re starting to run out of time, and so I think I’m just going to ask one final question, and I think we’ll all have maybe different answers. But understanding that currently inflation is high, loan rates are high, construction costs are high—building owners, homeowners, we’re all dealing with different things. So, like, in San Francisco, they’ve got building owners with vacancies; a lot of homeowners, they’re either stuck in their homes because of the mortgage rates, or-. I guess my question is, how would you convince someone to make the investment in their seismic resilience?

Janiele Maffei

Yeah, so I’m happy to start, because I want to tell you about, in 2014, our very first house that we retrofitted with earthquake, Brace + Bolt. This absolutely lovely man was the owner. We asked him if we could come and film at his house. We wanted to show the construction, show, and interview him. And completely unprompted, when asked how he felt about the retrofit, he said, I sleep better at night. I sleep better at night. And I thought that (what’s that joke?): And that’s what we’re going for. Because that is what we’re going for. And so, what I try to do when I—and as I said, I do my best work in person, because it’s the opportunity to listen—but what I try to convey is, I’m not chicken little, I’m trying not to be chicken little—the sky, maybe the sky is falling a little bit, but I have solutions. I’ve got some pretty good umbrellas to catch that sky. And the nice thing about earthquakes Brace + Bolt is, because of the cost-benefit and because the costs truly, particularly with this grant, are within reach of quite a few people, that it is a solution that, when explained to them carefully and with pictures and with some of the data that we have about the cost-benefit—what you could say, we’ve got now 22,600 houses worth of data. We use homeowners who have gone through the program, who will do videos for us. So with all of that, we’re trying to help them feel supported. So that, Amanda, is how we’re convincing, and we’re taking that tortoise route and saying, if you signed up this year, this might not be the year. In many cases, life gets in the way. What I’m hoping is that we continue to have support from FEMA to have a program that’s not a flash-in-the-pan, but one that’s here to stay to progressively make

California more resilient. And if we have that commitment from the federal government, we can take great strides, great strides to be inclusive throughout our state.

Barb Tobin

I think I would echo basically what Janiele said, especially because, like I said, when we do those site visits, I tell them, I'm like, this is for you to grab, and you see the family pictures on the wall, and those of us who have pets, we know our pets are our children as well, so as I'm seeing the doggies and the kitties, and just like, this is the opportunity—that's why I love working with it and working with the homeowners so much—this is the opportunity for you to grab your loved ones, for you to be safe in the case of a seismic event. And generally, with the people that Shyann and I are working with, they've been waiting for this, right? They've just been anticipating us to be like, you're next. You're next.

However, there are some, and that's where we might be at a home on the upper east side in Salt Lake City—however, we offer that homeowner match grant to everyone. You can't assume because you walk into—, and since January, we have expended almost all \$84,000 to homeowners who qualify for that. So that's kind of another feather in our cap, that we have that that we are able to offer to our homeowners as well. So that helps out. But I would say what you do is, you just say, this is to help you sleep better, for you to grab your people that you love, that you want to make sure are safe, that you're just that much safer. No, not that much, but that much safer in case something were to ever happen. And we definitely live in that area.

Shyann Hugoe

Yeah, Barb makes a really good point. We do get to talk to these people and kind of explain, Hey, it's just a life-safety, it's for you and your family. But I mean, that's really all that we have to do. It doesn't take much convincing for these folks. I mean, some of these folks have been on this list for six, seven years because we're only funded for so many projects every year, and we've got thousands of people on a list waiting for this. So it really doesn't—, we're not twisting many arms around here by any means. They want to go forward a hundred miles an hour and get it done. So we're lucky that way.

Jessica Chappell

And I would say from my purview here as a consultant in the Salt Lake Valley and a volunteer with the Seismic Safety Commission, the talking points that I like to use are, the points that I like to raise, is that you really can take a look at the Christchurch, New Zealand, earthquake sequences and see that it's not too much of a stretch to say that Salt Lake and the Wasatch Front region, maybe the Utah County segment, maybe the

Davis County segment, could have similar effects. Unfortunately, they tragically did have two buildings that had casualties in it, but for the most part, people did—, that life-safety design level did work, right? It did work. But what happened was really just a mass exodus, right? And when you talk about Utah and people who live here, there are people who are just, their roots go really deep and people that come, they might just come to ski, but then they end up staying until they retire.

And so, this is a place where people are grounded, and so I like to say, well, do you want to invest in seismic resilience, or would you like to move to Boise or Vegas or St. George after a major event? Because that is really the magnitude we're talking about here, with the disruption to our economic—. You can't live in a place where you can't earn a living. And so, when we look at these problems, looking at retrofitting URM homes, that's one piece of this puzzle, right? We've got other problems to solve, but as we eat this elephant one bite at a time, this is an important piece of the program. Very exciting.

Amanda Hertzfeld Well, I want to thank all of you for your time today and for your passion towards this work. Seismic resilience is—, I like how you described it, Jessica, is a very large elephant, and we'll tackle it one bite at a time. And I always like to say, as long as we move faster than geology, we're making progress. And I will thank you again so much for your time.

Pascal (CREW) This episode of the Ready to Recover podcast series was produced by CREW.org, with funding from the National Earthquake Hazards Reduction Program.

The podcast transcript and show notes—including links to resources mentioned by the speakers—are available at podcasts.crew.org.

You can continue to explore this and related topics by tuning in to the other episodes in the Ready to Recover series.

Thank you for listening.