

REALTIME FILE

Pacific ADA Center
EMERGENCY MANAGEMENT AND PREPAREDNESS – INCLUSION
OF PEOPLE WITH DISABILITIES WEBINAR SERIES:
FITTING ACCESSIBILITY INTO THE DESIGN AND CONSTRUCTION
STANDARDS OF STORM SHELTERS.

MAY 9, 2019

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>> Lewis Kraus: Welcome to the Emergency Management and Preparedness - Inclusion of Persons with Disabilities webinar series. I'm Lewis Kraus from the Pacific ADA Center, your moderator. This series is brought to you on behalf of the ADA National Network, made up of 10 centers federally funded to provide training, technical assistance and other information as needed on the Americans with Disabilities Act. You can reach your regional ADA Center by dialing 1-800-949-4232.

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I want to remind everyone that the webinar is being recorded and can be accessed on the www.adapresentations.org website in the archive section next week.

This is the fifth year of this webinar series which shares issues and promising practices in emergency management, inclusive of people with disabilities and others with access and functional needs. The series topics cover emergency preparedness and disaster response, recovery and mitigation, as well as accessibility and reasonable accommodation issues under the Rehabilitation Acts of 1973, the Americans with Disabilities Act of 1990, the ADA, and other relevant laws. Upcoming sessions are available at www.adapresentations.org/schedule.php.

These monthly webinars occur on the second Thursday of the month at 2:30 eastern, 1:30 central, 12:30 mountain, and 11:30 a.m. Pacific time. By being here you are on the list to receive notices for future webinars in the series. Those notices go out two to three weeks before the next webinar and open that webinar to registration.

You can follow along on the webinar platform with the slides. If you are not using the webinar platform, you can download a copy of today's PowerPoint presentation at the www.adapresentations.org/schedule.php web page.

At the conclusion of today's presentation, there will be an opportunity for everyone to ask questions. You may submit your questions using the chat area within the webinar platform and the speaker and I will address them at the end of the session. Feel free to submit them as they come to your mind during the presentation. To submit your questions, you can type and submit them in the chat area text box if you're using keystrokes, press control m and enter the text in the chat area. If you are listening by phone and not logged into the webinar, you may ask your questions by e-mailing them to adatech@adapacific.org.

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Today's National Network Learning Session, Fitting Accessibility into the Design and Construction Standards of Storm Shelters. The ICC 500 is a standard for the design and construction of storm shelters for protection from tornadoes and hurricanes. This course will review where storm shelters are required by the International Building Codes. There will also be an overview of the technical, or how to, requirements in the ICC 500, including access for persons with disabilities. The needs of the type of shelter differ because of the differences between tornadoes and hurricanes. Some of the biggest difference are the amount of warning time to get to a shelter, the time the of course pants will stay in the shelter, and the differences in the forces from the wind and debris on the shelter. We will explain those differences and the why behind those requirements.

Guiding us through that today is our speaker, Kimberly Paarlberg. She is a Senior Staff Architect in Technical Services with the International Code Council, the ICC. Her experience with ICC includes work in the plan review and code development departments with

responsibilities for the code development, providing code interpretations, instructing technical seminars, and authoring and reviewing instructional materials, code commentary and publication articles.

Kim serves as a code development secretary for the IBC Means of Egress/Accessibility and the IBC and IRC Structural Committees. She is ICC representative for development of the referenced technical standard ICC/ANSI A117.1 "Accessible and Usable Buildings and Facilities." She is also secretariat for the ICC 500 "Design and Construction of Storm Shelters."

Before joining the ICC, Kim worked as a structural engineer and architect. She is a licensed architect in Illinois and holds an Accessibility Inspector/Plans Examiner certification. She is also a member of her county Civil Emergency Response Team, CERT, and has completed several FEMA classes.

So, Kim, I will now turn it over to you.

>> Kimberly Paarlberg: Thank you, Lewis. Just to make sure, everything's coming ok for you?

>> Lewis Kraus: Yup. We hear you just fine.

>> Kimberly Paarlberg: Great. Thank you so much.

Welcome, everybody. Thank you very much for being willing to listen to me talk about the ICC 500 standard. Basically, today I'm going to try to give you a general overview of why the standard exists and how it was generated and then some of the basic requirements in there. This is an important concern for a lot of communities, has been a lot of attention for schools. We want to make sure everybody has access to these shelters and that they can protect everybody that's in those facilities that they apply to.

Basically, again, like I mentioned before, this is the ICC 500, which is the technical criteria for how you do something. We're going to talk about the type of shelters, why they're different, what kind of storms they work with, and the effectiveness of what might occur.

Where you have to have these shelters is required in the building code and the international residential code. This particular presentation talks about both the 2015 and 2018 edition. Most of the jurisdictions in the United States right now are using the 2012 or 2015 edition, just starting to move into the 2018 adoptions the edition of the standard that they are using in the 2015 International Building Code was completed in 2014.

We are going to try to learn about the 500, where you put them in, and the scoping and technical requirements. One of the keys that our training department has tried to do to help kind of liven up the presentation a little bit is they like to use ease icons. If I'm talking about a performance requirement, main idea or philosophy, they will have a key learning logo. If they have a table in the code book, they like to let you know you're looking at specific code text so they will use a code book logo. If it's an example, they have an example logo. Or if there's any questions that we can go over, that will also show up as an activity.

Because of this being a teleconference, Lewis is going to keep track of your questions that you might put in the chat, and we will cover those at the end.

Basically, the scoping requirements first. Scoping requirements is what, where, and how many. And in the building code they use reference standards for the technical requirements of how. They say that in Section 102.4, that if there's a conflict between the building code and the standard that the Building Code would control. And in this particular case because ICC is the Secretariat for the standard swellings in the building code we try and do our very best to coordinate. There shouldn't be any conflict between the two documents. It's just kind of a generic thing because we do use several hundred different reference standards

for different technical criteria.

So important definitions in the Building Code and in the Standard is that if you put in a storm shelter, it needs to use the ICC 500 for how to do it. And there's basically two different types: Community shelters and residential shelters. The residential shelters are defined as having 16 or fewer occupants. And they serve dwelling units. So, a small trailer park a group of town homes, a group of single familiar lip homes could share a shelter and it would still be called a residential storm shelter if you plan on having fewer than 16 people in it. But if you had a shelter that served an apartment building or a larger complex of trailers or town houses that would be called a community shelter even though it served dwelling units because you're housing more people than that.

The International Building Code, at first when you start specific requirements for storm shelters in Section 423, just reference you to the ICC 500 for how to do that. And the 2018 they added some language that said for buildings or structures designed as emergency shelters, you should design those as a risk category four structure because you wanted to make sure that that was available after any type of natural disaster event, earthquake, flood, tornado, hurricane. Although they call it an emergency shelter, it's important to notice that this is for the recovery, after an event, not for something that's going to protect you during the event. It's a different criteria for that.

For example, an earthquake is a good example. You might have recovery shelters that you want to be available after the event, but those would not be available during the event because you don't know when the earthquake's coming and you can't protect yourself during the event from something like that.

The scope of when you want to do these is when you are designing a storm shelter, have to use ICC 500 shelter. In 2015, they said when you provided for safe refuge against hurricane and tornadoes. But they revised that for what they thought was a better word, in the 2018, that we're providing protection from high winds such as tornadoes and hurricanes and they also added an additional sentence about if it's a recovery shelter, then that should be designed using the Building Code as a risk category four.

The International Building Code, like I said before, if you build a storm shelter it should comply with the ICC 500, but the place that they require you to have a storm shelter is in places where you expect emergency personnel to be in that building because you want to make sure that that emergency personnel is also available immediately following the event to help the population recover. So, if you're in a 911 call center, an Emergency Operations Center, fire and rescue, ambulance, police stations, fire stations, those new buildings do have to have a shelter to house occupants of that building.

The exception, buildings meeting requirements for shelter design and ICC 500 was talking about when an entire building was designed as a shelter. But that would be very expensive. Typically in a fire station or police station they'll have a room somewhere in the building that serves as the shelter. So, in 2018 they decided that that exception was redundant, so they removed it.

Another place that you're required to have a storm shelter is a school. If somebody's building a new school, they had to have a shelter to house the occupants of that school. There are exceptions for daycare facilities, basically group E, associated with a church because they assumed it was like Sunday School classes and that would be limited about when kids might be in there, maybe some other days out than Sundays but not continually occupied the same as a school. And basically -- the total occupant mode of the school.

Now, if you're working with a building and looking for an emergency evacuation, you don't know if a fire is going to occur when all the kids are in the cafeteria for lunch or whether they're in their classrooms. You determine for emergency exits, the number of children that could be in that space at any time. So, the total occupant load of the school might be much larger than the number of students and staff in the school. So, when they figured out the total occupant load was overdesigning the shelters and not really fitting what the school needed, in 2018 they revised the language to be more specific to who was actually in the school.

So, I think they've got a nice improvement in the 2018 International Building Code where it talks about you design for the greater of the, the total occupant load of the classrooms, location rooms and offices which would be students and staff, or the greatest of any individual and/or assembly space. So, if you have a gymnasium with seating and you might have a sporting event with kids from another school or parents in that gym, the storm shelter available for the school could accommodate that which would not be happening at the same time that you would have normal everyday classes. So one way or the other, your shelter would be designed to be able to shelter the people that were expected to be in the school.

They also added some language in 2018 about travel distance. If you have a multi-building site, maybe a grade school, junior high and high school in the same site. They might share a shelter or the shelter might be in one of the three buildings they want to make sure you didn't have to go too far because of the short timeframe that you had to be able to get into the shelter. So, if you have to leave the building to get to the shelter, you don't have to travel more than 1,000 feet from the door of your building to the door of the shelter.

And then just to be consistent with that idea, what category -- risk category meant when you had to design for stronger winds, stronger earthquakes and surrounding buildings because you wanted that building to be able to stand up after event, in the Table 1604.5, where the established risk categories is, for example, a hospital, a fire station a police station is a category four. If you have something that is a recovery shelter for after the fact, you want to make sure you design that for a risk category four even though it might not be designed the same as you would for a hurricane or tornado shelter for the extreme during the event.

This is a quick example. I live in central Indiana. We have in our emergency plan several different buildings in town that are designated as emergency shelters because if a tornado came through, it wouldn't take out the entire town. It would go through a piece of the town. So, a recovery shelter that would be activate would be the one where it was away from the damage. So, if the tornado comes through the west side of town and takes out the high school that's designated emergency shelter, then the fairgrounds is the building that would be open. And also conversely for that.

So, it's trying to have buildings that will be available after the event from the high winds but not necessarily be to the same impact resistance and extreme weather conditions that you have in a tornado or hurricane shelter where you're intending to design for effectively pretty much a direct hit on that building. The building would be gone but the storm shelter would remain in place.

Another thing that was a concern to people is that if the space is used for another use, like maybe a school has the cafeteria designed as the storm shelter, when you bring everybody in at the same time, you might be increasing your occupant load in that shelter path what the space would normally be used for. Basically the section about multiple occupancy says that you design for what the normal use of the space is as far as your risk category

because this is not a recovery shelter. This is a tornado or a hurricane shelter. So, you can just use your general provisions for those.

The international residential code which applies to single family homes and town houses, they also had some language in there that if you wanted to have your own storm shelter or if you wanted to have a shared shelter for an apartment building, a group of trailers or single family homes, trailers are not directly addressed by the International Residential Code but townhouses are. You still would use the 500 for how to do that.

So exactly what is the ICC 500? There's a picture of the cover of the 2014 edition. And the ICC 500 standard, the purpose of it is to provide design and construction requirements from safe rooms that provide refuge during the tornado and hurricane. It's not a recovery Center for after, but it's during the event. So it has to be able to protect from extreme winds. This was started in 2002, working with the National Storm Shelter Association. They actually started working on development of the standard and then dime ICC to see if we would work with them.

So, now we're the secretariat. We hold the meetings for how shelter is developed. Right now we're doing the next edition that will be out in 2020 through a series of telephone calls. If anybody's interested in participating in any of those, you can get hold of me and we can put you on the interested party list so you will know when those are available or we publish everything on our website. Anybody can look those up at any time, icc.safe.org and look for the ICC 500 development.

The first edition that we did, though, was in 2008, so it is brand new. It was trying to be consistent with the FEMA requirements for tornado and hurricane shelters. We try to review every standard every five years. The second edition of this came out in 2014. It took a little bit longer than five years for that. We will have another one finished by 2020. We developed that with a committee. They try to use what they call a Balance Committee. So they have a third users, so like, representative of school or somebody who actually was using the shelter, a third producer, so people that build them so they see how they have the issues coming in, how they work with different clients, and then code officials so, somebody who helps review/establish the safety protocol.

So, that's what they mean by a balance committee. Again, it's all public information. Anybody can participate. We won't make any decisions behind closed doors. It's all out in the open. And anybody can propose a modification to the proposal to address a concern that they might have.

We also do something that's called a commentary for the standard. The standard tells you what the requirements are, but the commentary, similar to ADA, is like an advisory. It kind of gives you additional information about where stuff came from, how it works together, and how all of this might have come into history, where the research were done, for example, for a criteria like that. It's additional guidance but not additional requirements that go with the standard.

So, the types of storms we're trying to address is a tornado or a hurricane. It's important to understand the differences between these types of storms so you can see what we're trying to design for.

If you look at a hurricane, this forms over water near the equator. It's typically in the United States known as a hurricane if you're in a different ocean, it might be a cyclone but it's effectively the same. How strong that is is judged by the Saffir-Simpson Hurricane Wind Scale and based on how much damage they're expecting with that type of wind.

You can have a hurricane come from a Category one to a Category Five. These are hundreds of miles wide, typically form over the ocean but can last for a really long time. Might fly over for a day. Some of them have been known to stay for as much as a week. Not only do they have is a large amount of rain and high winds but they will have flooding.

They can also, if close to the shores, be subject to storm surge. So, a hurricane coming in at high tide would be much worse than coming in at low tide. You can have wave actions. The winds range from 74 to 200 miles per hour. And typically the hurricane season in the United States is June 1 through November 30, but it has been expanding.

Tornadoes, those mostly form Overland and they're characterized by a large rotation of air columns commonly called funnels. You might have seen a lot of these happening from the Midwest over the last couple of days. They can get higher winds, actually reaching speeds of up to 300 miles per hour, and they have very high degrees of flying debris. Now, for their strength, they also are based on the amount of damage expected. And have The Fujita Scale, which goes from zero to six. It's always been from zero to five.

It's important to know that these are rarely over a mile wide, so you have a very concentrated area of damage. They usually last only for a few minutes. And you also have a much, much shorter warning time, you know, maybe five to 10 minutes when a tornado is spotted to get into safety. For instance, when a hurricane comes in, you could have 24 to 48 hours to be able to move away from the shoreline and get into more of a community shelter type environment. A lot of damage from debris more so than with the hurricane. Its winds ranges are higher. And also it's mainly mid-summer but a tornado can happen all year. Most of the time, though, tornadoes don't also come with floods like would with a hurricane.

To just a quick visual for how we're going to look through these. If I'm talking specifically about a hurricane, you'll see a little hurricane symbol. If I'm talking specifically about a tornado shelter, you'll see a tornado symbol. Really the primary difference between these two times is they're expecting people to stay in the hurricane shelter for 24 hours or longer and have a much longer time to get there versus a tornado shelter, they're expecting the maximum stay to be about two hours and you have to be able to get in there very quickly.

We're going to talk about the different occupant density that they have with that, what kind of sanitation requirements, they have to have water supply that are different, ventilation requirements, emergency power, and even the valuation for the size and speed of the flying debris which affects shutters, doors, and openings protectors that you might have.

And just a quick reminder, again, you have a difference between a community shelter which could be any size versus a residential shelter that can only serve residential facilities like a house or a townhouse, and it has to be limited so you're expecting 16 or fewer occupants to be in that shelter. So, if you go down the highway and you see this happens to be a post office designed as a storm shelter or a lot of the bathrooms when you go into a expressway pull-off will have a tornado shelter sign. I'm not sure if they're all designed for ICC 500 but those are the community shelters.

The ICC 500 standard is split into nine chapters. We're going to go through each of those separately but one is administrative, two is definitions, three through eight basically talk about the actual construction of the shelter itself; and Chapter 9 is if they use a referenced standard for something, that's what Chapter 9 includes that list of reference standards and the edition that they're referencing. So you will have, if your jurisdiction adopted the 2014 storm shelter standards, there will be specific editions referenced for what might support or back that up.

Chapter 1, Medication and Administration. It covers both tornado and hurricane shelters. It can be for a separate structure that's designed as a tornado or hurricane shelter or it can be a small room or space within another building. You can provide alternative ways to protect people. It doesn't have to be the way prescribed here. But what the code official will be looking at is for something that meets or exceeds the safety requirements that are specifically named. That's called the alternative compliance pass. So if you've got a new way to do it or new, improved technology that alternative compliance pass lets that move forward without necessarily having to be limited to what specifically is described. And if you have a surrounding building around that shelter, the surrounding building would be designed in accordance with the adopted International Building Code.

The Occupancy Section 104 basically says if you have a shelter that that's all it is is a storm shelter, not used for any other purposes, if it's designed for more than 50 people, would consider that an assembly 3 use. If it's for less than 50, would consider it a B occupancy. They use those identifications to determine what type of construction, the heightened area of limitations, if you have to have a sprinkler system or not for when the building is generally used. If it has another purpose or use, then you would just follow the general rules for the building.

The code official will come in and do inspections on the facility as it's being constructed. They will also look at the plans. He can ask for some things to be peer reviewed and will review those peer reviews special inspections is if you might have some type of unique system that needs additional expertise to make sure something is installed correctly or to make sure that a product is the right product for that area. They can call in additional experts to help them with that. Everything about that storm shelter has to be on the construction drawings. There's a list of what has to be provided for that data. And then we're also looking at the labeling that is consistent with the FEMA requirements in P-361.

Chapter 2 is where you find all the definitions that's where you find, again, the criteria for the difference between a community storm shelter and a residential storm shelter. They also have multiple definitions, but a couple of quick examples is they talk about areas of concentrated furnishings, unconcentrated furnishings, or areas of open plan. Basically, the idea is if you've got something fixed in place, like the bathrooms that you see in the top picture, or unconcentrated furnishings like maybe a school classroom where you've got furniture in there but you can move most of it around, versus open plans which might be your gymnasium where it's totally open. If you don't have to make allowances for that stuff being in there, you can get more people than in a room that might be the same square footage. So you take less of the roaming as open for people to move in. It's concentrated furnishings versus unconcentrated or open plan.

They also try to take into consideration what might be around the building, that might cause damage to the structure of the shelter itself, collapse is like storm shelter has a very tall portion of the building next to it you want to make sure you design for that in case that other building that's not designed to resist the hurricane might fall on your shelter. You don't want that to damage the shelter.

Laydowns is mainly like a tower so like the picture in the middle, that actually happens to be a tower that came down during an ice storm. If you had something where it was supported by cables or something, that kind of structure that would lay down. Large trees would be another example. You want to make sure it wouldn't damage your shelter so it would still act as you wanted it to.

And then rollover is maybe you're next to a highway or you're part of a factory and you know there's going to be a lot of trailers there or trucks or something that when the wind came in, they might roll into your building. That's other things that you want to try and protect from. So, there's descriptions and definitions about what all of these things are that you're using as part of your design.

Another example is impact-protective systems which basically describes anything you use to cover up an opening. It could be a shutter to roll down in front of windows. It could be a door to close an opening. Something that you have to design so that it will stay in place in the wall because it's effectively a weak point in your wall that's forming your shelter.

Rebound impact is when you have a test missile and they actually have what looks effectively like a cannon that shoots a 2-by-4 out to try to test these things. You want to make sure that it's not only protected from direct impact but from rebound impact. And I've got an example of when you're looking at a rebound impact where you have trajectory limits.

You can see what is called a baffle entry system where rather than having a door because maybe you don't want to take the time to close the door or having something that will lock when you get people rushing in, you might see this happen a lot of times in bathrooms. But if debris flew in, it wouldn't be able to get to that protected area behind the baffled entry, like bounce around in the entrance but people would still be able to run in quickly and get into a safe space. That's called a protected occupant area.

We've got a lot of different ways of doing openings other than having a door that's shut and locked and then maybe somebody gets out on the other side. That applies to tornado shelters versus typically in a hurricane shelter you want to have something that you can close and lock and you don't use the baffled entry system.

The sheltered envelope, the criteria is what you look for in your Chapter 3 and 6. Combined 3 and 6 because it's a little bit easier to explain the structural criteria along with the fire safety criteria. Basically what you're trying to do is you want to make sure that whatever you build can resist the high wind pressures, both blowing at something in the section that might be on the other side as well as the flying debris.

You can see a picture here from a tornado that trees, cars, the next door neighbor's garage is flying around. You want to make sure that that shelter can resist those flying debris more than anything else.

You also want to make sure that the main structural system is designed for this as well as -- what they mean by components and cladding is the windows, doors, and any exterior trim that you might want to put on there or roof Shingles or however you designed the roof. You want to make sure that you have basic life safety and health requirements for the occupants within the shelter.

When you're looking at the structural features, you are going to be designing for water loads, especially in hurricane area. You can have lots of rain. You don't want to get your gutters filled and then have a foot of water on the roof. You want to make sure that everything is designed for that kind of ponding as well as wind and rain being driven in through cracks. The wind loads, like mentioned before, the pushing and the suction on the other side. The debris impacts as well as the other concerns we've talked about was the definitions rollovers, falldown, laydowns.

What the rain loads are designing for is six inches per hour in addition to the rate that you find from the normal rate on the map. We want you to look for the hydrostatic loads, so increases in water cables or flood areas. And if you're in any type of area that's subject to

flooding, either the 1% per year, which is sometimes called the 100-year flood or if you're designing for fire station, police station, it's something you want to make sure is available after the event so emergency responders can get out there and help people. They will ask you to look at the 500-year event. So, .02% chance of happening in any one year. Make sure address those in the design of the shelter.

This picture here is the example of the wind contour map for tornadoes. Red area in the middle, which I believe touches 14 different states, is what sometimes is termed a tornado belt. Where you have the highest wind, if you're a fire station, police station, 911, call center or school in that red area, that's when you want to make sure that you have a storm shelter in your new buildings. That's required.

They have a different map for what the wind loads would be for hurricanes. Basically that effects the Atlantic coast and Gulf Coast of Mexico as well as Hawaii, Puerto Rico, Guam, and the Virgin islands versus the concentration for the tornadoes are typically in the center of the country.

Lewis is asking me to be a little bit louder, it looks like. I hope I can do that a little bit better here.

The wind loads we use a document that's put out by the American Society of Civil Engineers, ASCE 7. They use modifications to method 2. They talk about what direction the wind is most likely to come, the importance factor of the building, is it a hospital, police station versus a farm building, for example; exposure category, is it up on a hill where it can get hit from wind at all sides or is it in protected area? Are there topographic effects? Is it close to a hill? Is it in a valley that might focus the wind? Enclosure classifications and atmospheric pressure changes are all addressed in the different types of wind loads you would be looking at.

Most of the things people tend to see, though, is the debris impact. If you've ever gone any of the tornado museums around the country, you might have seen where a straw was actually driven through a board. They've done a lot of research on the impact of both a rod or a plate type missile. So if it's a -- is it a rebar, a piece of pipe versus a piece of plywood off the siding of the house? How are those different types of debris when they impact going to affect something differently?

They use the test method on doors, small shutters for the impact load. They talk about hitting it at the corner versus the middle, hitting it repeatedly at approximately the same locations to make sure that would still stay in place within the frame, and, again, because the tornado winds are higher, the tornado shelters will have a much higher debris in missile impact requirements on any enclosure of the shelter or the opening protectives than would with the hurricane.

They have different other things that they look at. For the weather protection, if you've got a door exposed to the outside, you don't want to get water coming in or underneath your door. Is it enclosed within a host build organize off by itself? Make sure it's connected to the foundation so it doesn't roll over itself. And any other type of penetration that might be through the walls, like if it's used for another purpose or even during the event, you have to have some ventilation for people to get fresh air. Heating, cooling, if the shelter happens to be a bathroom where the pipes come through the wall, you want to make sure if the building gets ripped away, that opening is now a hole, that somehow that's protected with some type of device. So you never end up with an opening.

They also have a concern that because fires often break out after a storm that if

you're in a host building, they want to make sure that the wall between the shelter and the host building at least has a fire resistance that will offer a little bit of protection to give the occupant as a chance to recognize that that fire is occurring outside shelter and be able to move out through the building to get out.

As far as a fire that might happen inside the shelter, they have requirements for fire extinguishers and everything because maybe you're not being able to rely on your normal sprinkler system because the damage to the roof of the existing building has ripped it all away. You have to still be able to protect yourself within the shelter.

So, that's mostly what's in Chapters 3 and 6. Chapter 4 talks about siting. So when you're looking at how to locate this. For example, if you're doing commercial tornado sheltering at schools, multi-building sites, remember, you have to be less than 1,000 feet to get from one door to the next building or where the shelter is. You don't want people to have to travel out very far within that short timeframe.

Residential shelter, a lot of people -- you've watched "Wizard of Oz" where they go in the backyard and below ground. They don't want that shelter to be more than 150 feet from your home. If you have it within your house, in the basement, or there's some types of shelters that go under the garage -- there's so many different options that people have come up with to provide safety. It's great, but you don't want to have to travel more than 150 feet outside to get to that provision. If you can do it inside, that's better.

I mentioned flood provisions. Before they want to make sure that your commercial and residential shelters are elevated to limit the chance of flooding. So, it's different depending on if a tornado shelter or hurricane shelter, commercial shelter or residential shelter.

Hurricane shelters, you're dealing with on the coast the storms are coming in. And with the longer response time, you can actually locate those so they're high up enough ground that you weren't going to have concerns about that because you have longer time to get there versus in a tornado shelter, the chances of the tornado happening at the exact same time as 100-year flood are much, much lower if almost not existent.

So you want to make sure you're taking both of those into consideration when you're looking at if you need to elevate or not. Most buildings now, we try to locate outside of the 100-year flood, but on a risk category four like police station, fire station, hospitals have to look at a 500-year flood. So you need some additional considerations about that.

There was some criteria in thereabout the highest recorded flood elevation but not everybody has a flood based on normal occurrences. Like, for example, the Johnstown flood was because a dam gave way. That's not a typical consideration. So, to design for the tornado and the rain and damage at the same time wasn't justified. So the next edition of the standard is actually -- right now the committee voted to take out the highest recorded flood of record.

So, the shelters have to be protected from the possibilities of any high hazard materials. They want you to work with emergency management associations to make sure if you have a community shelter, you won't locate that next to a chemical plant, for example. But at the same time, if the storm shelter is in the chemical plant to help the people there, then you want to allow that. That's why they want you to work with emergency management on where those choices are and what kinds of hazardous materials might be allowed. But they at all costs do not want you to be in a Coastal V Zone or floodway because we know that was a chance of flooding happening during the storm. So they don't want to allow there even with short notice.

Chapter 5 probably is what most of you interested in this covers accessibility as well

as occupancy and needs of egress. And Chapter 7 is the shelter essential features and accessories. Basically they want to address the basic occupant life safety and health requirements including everybody has to be able to get in, so people with wheelchairs, walkers, canes, crutches. There's allowances for people with vision impairments regarding the signage. Everybody has to be able to get into a community shelter.

Residential shelters are not required to be accessible. You can build it if you want to but it's not a requirement.

There are rules for Means of Egress if used for a -- other than a shelter you design from that and then address the possibility of a single exit door being blocked when you're talking about a shelter.

We're also going to look at lighting, sanitation, ventilations and fire safety and the minimum occupants.

Your essential features are looking for, you know, how many people are you going to be able to put in there, how many doors. you only have one door and that door gets blocked, do you have an emergency escape hatch. Ventilation, is there going to be enough air for everybody feel comfortable within the building to be able to breathe? Depending on the length of stay, water and sanitation requirements differ between the hurricane and tornado shelter because one's short stay and one long stay. Kind of emergency features, first aid kits, fire extinguishers, that kind of stuff. Where is it? How can it be signed so everybody can find it? And make sure you always have an accessible route for those community shelters.

The hurricane shelter, because it's a longer stay, they want more space. You're going to have to be comfortable for a longer period of time. 20 square foot per person for the number of people you're expecting to have in there. If you're going to have wheelchairs or people that might have to be moved in, in beds, 20 square foot per person in a wheelchair but 40 square foot per person in a bed.

The tornado shelter, because the time is much shorter, the five square foot per person. Person in a wheelchair, 10 square foot. Physical size of the person sitting in a mobility device. And 30 square foot for a person who is transferred into a bed.

For the residential shelters, hurricane shelters, seven square foot per person, tornadoes three square foot per person. For one and two-family residential shelters, if you go to the group shelters, like for a group of homes, and they're asking for 10 square foot per person in a hurricane shelter and five in a tornado.

In my home -- I don't know about, but when I got a tornado coming, I'm grabbing my daughters close to me, so I don't need as much space if it's your family. You're all holding on to each other real tight.

The number of exits. Basically whatever the space is used for normally. So, like a bathroom typically has one way in or out. If you want to use that as the storm shelter, you might get enough people in there that you have more than 50, which normally would require two exits. But since the use for that is so rare, they're going to let you just use the single exit for the bathroom like you would normally.

But if you have a single exit and something falls in front of the door so it gets blocked, then community shelters also have to have an emergency hatch that would go out in a different direction. And the allowance, if you choose a roof hatch, for example, you have to have someplace you can store a ladder in there. So, again, just so everybody can be guaranteed to get out after the storm.

The ventilation depends on if it's a tornado or hurricane shelter, residential or

community. If your occupant load of community shelter is greater than 50, it will vary the amount of ventilation you'll have.

If you're going to have toilets, you've got a higher need in hurricane shelters, again because of the length of stay. You can have toilets within a shelter that are already in the space. They can be converted to emergency mode. You can have chemical toilets stored in that facility because you might be using, say a classroom that wouldn't typically have toilets as your community shelter. So when you move people in there if it's a hurricane, you have much higher need for the toilets than in a tornado shelter.

And also hurricane shelters have to have storage for potable and waste water because if the storm's coming in and everything's flooding around you, your normal septic systems and/or water supply probably won't be there.

Tornado shelters have to have fire extinguishers in case a fire starts within the shelter and first aid kits. The first aid kit should be sized on the number of people you're expecting. And community shelters have to have actually two kinds of lighting, emergency lighting for a building usually applies to the main aisles when you are trying to do emergency evacuation during maybe a fire event where you've lost power in the building versus the type of lighting that they want shelters would be normal lighting so people aren't in the dark. So, you're talking about regular lighting but that will be on generators so it would still be active if you've lost power. Because in a storm it's a good chance you will lose power and it might continue to not have power for a while.

Again, that's based on the length of stay and how many people you have to have in those shelters. So community shelter, hurricanes, where you're in there 24 hours or more, you want to make sure that if the shelter is greater than 50 occupants, you also have additional lighting criteria. Some of the smaller shelters they'll let you use flashlights as a backup, but the bigger ones want generators.

Like I mentioned before, it repeatedly says in the standard that all community shelters have to be on an accessible route. So always people will be able to get in there whether they're using mobility device, walkers, canes, crutches. Everybody has to be able to access the shelter for community shelter.

Residential shelters can be accessed by a stairway, ladder, or an alternating tread device. So if you have a residential shelter and you have somebody who has mobility issues, there are residential shelters that are constructed above ground that could provide an accessible route. But that would be decided by the family on a case-by-case basis.

Chapter 8 is our test methods for impact and pressure testing. And I mentioned before they actually have something that looks like a cannon that shoots a two-by-four. You want to check for the rods as well as the flat panel type plate impacts. And they have multiple diagrams in this portion of the standard that talks about where those debris impacts have to be tested.

So if you have a double door, for example, you want to make sure that you test it at the top edge, the center, the outside edge, the corners. If you've got stud supports in between the studs, on top of the studs to make sure that everything's going to stand up in place. It's really kind of interesting test if you ever get a chance to look on YouTube and look at some of those.

Chapter 9 is the reference standards. Like I mentioned before, that's when somebody uses different standards for specific criteria, for maybe ventilation requirements, windows, or how to determine the rain loads. And it gives you the full name of the standard.

For example, ICC 500 is how in the building code the documents refer to but the actual title of it is Standard for the Design and Construction of Storm Shelters. So you have the full title and then you have the year because you always want everybody to be knowing exactly which book to get their hands on.

That's the point of Chapter 9 to give more specifics and it also gives where the standards are available from. So called the promulgator, it's where the address, e-mail and phone numbers might be if you want a copy of that particular standard.

In summary for today, you have the building code says if you have a storm shelter, it should comply with ICC 500. And the Building Code sets up the building to withstand the designed wind event. But that's assuming high winds, average expected in a given year. It's not going to protect your house from a direct hit from a tornado or a hurricane.

The tornado-prone regions, especially tornado alley, the wind loads typically are 90 miles an hour for your home. So that's why you want to have a storm shelter inside your home because the tornadoes, as we've demonstrated, can be up to 300 miles an hour. So if you lose your house, great. You don't want to lose your life. That's why you have the storm shelter in your home.

In a hurricane-prone region, along the coast, depending where you're located, winds typically range from 90 to 150 miles an hour so you'll withstand a lot of storms with how your building is normally designed but it's not going to withstand a direct hit from a hurricane. That's why you want to have those shelters if you're in the hurricane-prone regions.

Again, it's going to be way passed what your building is designed for. It would be extremely expensive to design your entire house to act as a storm shelter. It's better to go into someplace in the center of the home with multiple walls, smaller space. Most home shelters will be a closet, a bathroom. Some people choose to put them underground, depending on the area you are at, you have. So I just want everybody to be clear if your home is built to code, it's going to withstand high winds in extreme weather events but it's not going to withstand a hurricane or tornado. That's why you need the shelters.

So, you need to decide yourself. You know, look at your risk. Are you the kind of person who when a hurricane is coming, you're going to be one of those people who evacuates right away or are you going to be the kind of person who hangs around longer? Or maybe you don't live near the coast because you don't want to deal with hurricanes. Then you don't have to worry about that.

So you want to do your own risk assessment to see what best type of safe room you need. You don't have to design for a hurricane if you live in St. Louis. You want to make sure that the safe room has your preferred method of wind protection. You want to do the baffled entry type system which you see in a lot of airports or facilities where people might be traveling from long distances? You might not be familiar with the space versus, you know, everybody's in the same location and there is a protocol in place, like a police station, fire station, office with a door might work fine because they're going to make the call. Everybody leave your station and go to the safe room. And they've got a count of the people in the building. And they can close the door. And lock it for protection.

I mentioned before the 2015 started the requirements for storm shelters being required in tornado alley for schools and emergency response facilities but it's not required in a hurricane facility. And maybe it's not needed there. If there's a hurricane coming, school won't be open that day. They will send the kids to the parents and the parents decide whether they stay or leave depending on where they are at versus a tornado that could happen at any time.

So, that's why they've chosen to require them now in tornado alley. If somebody wants to build, use the ICC 500 for how to make sure that's the right kind of shelter that will work for you.

If you have a shelter, we can help reduce injury and death. Even afterwards, though, you want to make sure you have an evacuation plan, place where you can gather if a tornado comes through town. The mom's home with the kids but the dad is off at work someplace. How are you going to be able to communicate if there is an event? The roads are blocked, or for some reason people can't get home, how are you going to leave a message for people? What's your follow-up plan? How are you going to work? You want to make sure you plan, practice, and review.

If you have supplies, maybe you're doing a hurricane shelter and you're on the coast, make sure you have sufficient food and water that are brought in there. Recycle back through the water. You can't leave it in there forever, food, expiration dates. Don't be like some of the movies you see. They found a bomb shelter from 50 years ago. Canned soup really doesn't stay good that long. Make sure you refresh. Make sure that you go in and make sure stuff is maintained. If you're in a community shelter or the opening protective working, what kind of maintenance plan do you have in place for that kind of stuff?

So just a quick review. This is the map of what's considered Tornado Alley. The red area being the greater than 250 mile-per-hour wind tornadoes expected. If you live in this part of the country, depending, again -- look at the topography, area you're located. Is it reasonable to have a storm shelter installed in your home, community, church, business? Make sure that you accommodate for everybody. So, again do your own risk assessment.

Tornado shelters are not required in hospitals right now. And the reason I wanted to bring this up is because it is a category 4 building. There is concern for the people that are in there that they need assistance. But the reason hospitals are not required to have shelters at this point are mainly because they've got a lot of people that have to be on ventilators or IVs or special equipment.

They have huge emergency power systems provided all over the hospital. They'll have a in place plan with their staff. They will be trained to move people away from the windows so nobody gets hurt if something comes in. But they haven't been able to find a good way to design a storm shelter and be able to move everybody quickly, especially in a tornado facility, into a storm shelter and still be able to maintain those life support systems.

As far as hurricane, if any of you watched when hurricane storms got to New York, they tried to evacuate some of the hospitals there. In fact, that's the only time that they've ever fully evacuated a hospital. And it wasn't the storm shelter. It was getting the ambulances in and being able to load the patients up and get them out there that was the controlling factor. So that's one of the reasons why hospitals are not required to have the storm shelters at this point. If they want to, they can. Maybe get that in a small emergency aid stop.

If you're in the tornado belt, yes, you are required to have a storm shelter in the fire station. Too short of a time for the community to move in there but the firemen, whom you want to be able to be ready through the to help as soon as the storm is over. That's why you have the storm shelter in the fire station. So even if a fire station gets destroyed, maybe they can get to their trucks. Maybe not. But at least they're trained personnel that can be moved to another fire station that didn't get hit that could still help to fight with the event.

So, I hope that this overview of the ICC 500 was helpful for you today, that it might help you decide whether you need a storm shelter. Maybe your risk is not that you would need to have something in this place of business, but if you do, what's the best way to work with it?

How can you make sure everybody understands the plan and how that works?

So, I would like to thank you for your participation today. And if there's any questions that Lewis would like to give me today, I'd be happy to answer anything that you might have.

>> Lewis Kraus: Great. Thank you so much, Kim. That was really a lot of really great information.

Everyone, this is your chance, the time to submit your questions. Go ahead and do that in the chat window. We'll get to those as they come in.

The first question I'm not sure how would answer it. Have you seen storm shelters in the northeast?

>> Kimberly Paarlberg: Mostly the northeast, because some of the areas have been hit by hurricanes, not very often but it's starting to occur more and more, there are facilities that are looking at designing a town, for example would have a community hurricane shelter. I have heard about them being produced.

There are several people on the ICC 500 Committee that builds shelters all over the United States. Given there's probably higher concentrations around the Gulf of Mexico, Florida, North and South Carolina, but there are some being constructed especially, like, in New York, for example. We had a pretty big scare -- what was it, three, four years ago? The hurricane moved so far north, effectively hurricane-force winds were hitting New York?

>> Lewis Kraus: Right. Ok. Let me ask you this. Because we're really trying to deal with the ADA and disability, so how does some of the standards that you're talking about, especially the residential, deal with group homes? Or you're talking about 16 people in the residential shelter, so would that cover a group home in those instances or could a group home be more than that? How does that work in?

>> Kimberly Paarlberg: Group homes can be more than 16 or fewer than 16. If I had a small group home, if I was looking at wanting to build a shelter as part of that, I would probably choose the type of shelter that could be constructed somewhere in the center of the home on the ground floor rather than trying to go into the basement. I would pick something that might serve as a walk-in closet or a bathroom or any type of small room that would not have a lot of windows in it.

It doesn't limit that you can't use it as a regular space but, you know, everybody in the group home would be familiar with where that would be located. You'd have to practice. You'd have to have drills and plans for this kind of stuff. So, you can use it for a normal room but for accessibility you probably would want to make sure it was on the ground floor versus -- I'll use my own family as an example. My mom just had a knee replacement, so she's not the best with stairs. But if there was a true emergency, I could get her down into a couple of steps.

So maybe -- there's also types of shelters that are half recessed in the ground that you can put in your backyard. There's even the type that are fully recessed, specialization that they put underground in the backyard or they bury them in the garage under the concrete slab. So, you're going to have to make your own assessment.

For a larger group home, when you're in a community shelter, the size of those tends to make sure that they're on a main floor level someplace. If you choose to go into the basement, then maybe you're going to have to look at making sure that you have a platform lift with a battery backup so even if you lost power, people would still be able to get down there. After the event, similar to a high-rise building, you might need people to assist to evacuate. But the point is to be able to get in there so that you're protected.

In more of the coastal areas where you have the community shelters where you

have a lot of time and people move to the shelters, it's important to plan to make sure there's enough accessible parking spaces for people to be able to get there with an accessible route from parking into the building. That's why sometimes I think it's better to have buildings that serve a normal purpose and the shelters not the only thing they use for. People think if they're using it all the time, that's going to be more people are watching to make sure that's maintained, always available.

>> Lewis Kraus: Ok. Next question. Is this a summary for ICC 500 -- I'm assuming this person means with FEMA. They wrote secondly "with FEMA." And would you recommend taking the ICC 500 with me being the disability services coordinator for [Indiscernible], Florida.

>> Kimberly Paarlberg: FEMA is on the ICC 500 Committee. They are viewing it as replacing -- P-361 is how they want shelters designed. So, they are working with us very extensively and not only with the storm shelters but with flood, earthquake, everything FEMA is involved with. They are working with the Building Code to make sure that your insurance programs work with the ICC documents and the FEMA backing so that you don't have to worry about one overriding the other or anything like that. We're trying to work together as a team to make sure that you've got safety protection for people.

So, yeah, I know -- in fact, the Chair of the committee is from FEMA.

>> Lewis Kraus: And just to confirm in the captioning because there was a pause they were trying to capture. Were you saying it's replacing the P-361 course?

>> Kimberly Paarlberg: I think that's the federal document. I don't have it in front of me so I'm not absolutely positive. But it was -- FEMA had a document that if you wanted to get FEMA funding, you had to design to the standard. That's what the ICC 500 will meet or exceed those. And you use it whether you get FEMA funding or not.

>> Lewis Kraus: Ok. The next question: Do you offer training on emergency evacuation procedures for individuals with disabilities?

>> Kimberly Paarlberg: We don't have a specific training geared towards people with disabilities because we're a building and safety code anybody can come to our trainings, but our primary focus is talking to contractors, architects, building designers, code officials so that they make sure that the buildings are constructed so that all of those things will be available in the building.

And then, of course, we have requirements of the fire code, under fire and safety evacuation plans that talk about making sure that if there is a location where you want people to congregate for assisted rescue or if you have a building like a hospital where they're doing defend in place, you know, what kind of plans do you have in place, what kind of information is available on the drawing so that information is related to the fire department, police department when you're going to have practice drills, who has to be participating in those practice drills, how often they have to be there, and every type of emergency.

I'll use a school as an example. A school has to have a fire practice drill every year, but depending on where they are at, the high school in my town we have earthquake drills, tornado drills. One cannot replace the other. You have to have fire drills once a month. You have to be able to do whatever the school has decided is part of their emergency plan you work on an annual basis with your emergency responders.

It can be reviewed, public record. So, if you are a person with a disability and you don't feel your needs are being addressed, you make sure that you ask for that information and participate in the plans to do the revisions. That would be the lockdown plans for shooters, hurricane, tornado, if there's an earthquake, you know, anything.

>> Lewis Kraus: And I'm going to add a couple of things to that question. You should definitely look at the archive of our webinars here at www.adapresentations.org. There have been several mentions about evacuations, at www.adapresentations.org. And next month there will be an evacuation chair webinar which is important if you're in a high-rise building.

And then the ADA Centers, like ourselves, around the country, if you call 1-800-949-4232, can get you information about emergency evacuation for people with disabilities.

And if you just want some written materials, there are materials on our website, a voluminous amount of them under www.adapresentations.org under the emergency publications and resources.

All right. Another question here. How does the community, for example, people with disabilities, get to tie into the development of standards or be able to make comments? Is there a way for them to do that?

>> Kimberly Paarlberg: Sure, there's a couple of different ways at least from the building code which is a minimum public health and safety. We have public hearings. That's where I was until yesterday, at our public hearings. We rotate around the country. This time we were in Albuquerque, New Mexico. Yes, Albuquerque, New Mexico. I'm mixing up Arizona right now.

So, we were in Albuquerque, New Mexico. And the codes -- suggestions that were submitted in January. We hold the public hearings so that people can come and testify in support of their proposals and then there's a committee of users, producers, and code officials that listen to the arguments. And then they vote on whether they think the revision is a good idea or a bad idea.

There's a second round for if people don't agree with a decision that was made where those are submitted in July and they will be heard in our meeting -- our fall meeting is in Vegas. Last year we were in Richmond, Virginia. We're going to be in St. Louis next year. So we rotate around the country. Anybody can submit a code change through our website. And then, again, just run through the process. They don't have to be there to participate.

Just this last week we had multiple changes from two different accessibility groups that were really interested in how accessibility was applied in existing buildings. One of the things that was added is that if you have an existing building that's doing a major retrofit, that they wanted you to add two-way communication systems in the elevators and lobbies so that if somebody's stuck, the elevator has stopped working, and they can't use the stairways, that they have a way to communicate with emergency responders. So that was something that was added for existing buildings this round.

And then the standard, the storm shelter standard, at least, is holding meetings now. The meeting was today, actually. I left the meeting to come for this. So they meet every two weeks. Again, it's the same idea. People can submit proposals if they want something revised in the standard. This particular standard, one of the concerns that was brought up was the communication about where the shelters are and the signage that should be provided so that everybody that comes into that building would know where they would have to go if it wasn't the whole building as a storm shelter.

So, if you have a community shelter in Florida that's inside your conference facility, for example, once you enter the building how would you know where to go? And they were talking about the requirements to make that visual in tactile and Braille and have it in different locations so they could be easily found by anybody who came in.

So, anybody can do that. They're always trying to make stuff better, so it's easier to

use. Typically you can find it on the ICC website. If you can't find it, you can contact me directly. I'm more than happy to help people figure that kind of stuff out.

We come out every five years. The Building Code comes out every three years, Standard every five or six years. So we try to update so we're current with technology, the new information about what can be provided.

If anybody's interested in the ICC accessibility standard, we typically hold our meetings in Washington for that standard, but you're able to participate via the telephone if you're not in Washington, DC, when those meetings are running. We do everything on public record on the website so you can see what changes are proposed, when you can propose changes and ideas of your own, what were the decisions were, what the reasons the committee gave. We try to keep participation as open as we can.

>> Lewis Kraus: That's great. Thank you so much.

And thank you so much. I do want to express my appreciation, and I thank all of our audience appreciation, that you had to cut short your meetings to come and do this webinar. And not only that but to do it in the midst of a storm that you had to battle your flights to get home to be able to get home on time. We really appreciate that.

>> Kimberly Paarlberg: Yeah, the tornadoes in Kansas City left me in Kansas City last night so I was in the airport really early this morning.

>> Lewis Kraus: Oh, my. Oh, my. Again, thank you so much for that.

All right. We're going to move here -- oh, do you have a couple more slides, Kim, you wanted to show them?

>> Kimberly Paarlberg: Just the ICC has additional training. If anybody's interested in any of our training, like I said, it tends to be geared more towards contractors, code officials, architects and designers but especially the accessibility class.

And I talk also at the National ADA Symposium about building construction things. If we can get the buildings built right, then it just makes life easier for everybody. You don't have to ever file a complaint under the ADA. We want to make sure the building is built right in the first place. That's our priority and goal. That's why we spend all of this time trying to talk to this group of organizations, to make sure that they understand the concerns or needs for public health and safety, storm shelters, accessibility, anybody who is using the building and the built environment. How do we make sure everybody's comfortable, healthy, safe?

>> Lewis Kraus: All right. Great.

>> Kimberly Paarlberg: And also, let's plug the ADA Symposium, too. You all come to Texas. Hopefully there will be no tornadoes. [Laughter]

>> Lewis Kraus: Right. Thank you so much.

For everyone listening, if you didn't get a chance to ask your question or you think of something afterwards, you can certainly contact Kim or get there probably through that e-mail or phone number that's on the screen or you can also call your Regional ADA Center at 1-800-949-4232 and either they can answer or get you to the ICC if you have a specific question about that.

You will receive an e-mail with a link to an online session evaluation. Please complete that evaluation for today's program. We value your input and want to make sure that our funder understands the value of what we're putting on here.

Once again, thank you so much to Kim for sharing her time and knowledge with us. And a reminder that today's session was recorded. It will be available for viewing next week at www.adapresentations.org/archives.php.

Our next webinar, June 13, we will be joined by Professors Steve Lavender and Glenn Hedman for an overview of emergency stair travel devices. We hope that you can join us. Watch your e-mail two weeks ahead of time for the announcement of the opening of the registration.

Thank you very much for attending today's session. Thanks again, Kim. Have a great rest of your day, everyone.

>> Kimberly Paarlberg: Thank you. Bye-bye.