Prepare Your Facility for a Tornado

John Mathews: Let me take a look now at tornado risks. In southern states, the risk of tornadoes spans from January to September, a little bit longer than it used to be. In the northern Plains and the Midwest, tornado season spans between June and July, peak tornado season. Peak tornado season in the southern Plains is May to June. I will say that in the Northeast, tornadoes can be experienced through August, a little bit later than the rest of the country.

Our advice is that when you evaluate the risk of tornado winds, if the tornadic winds exceed 100 miles an hour, you should evaluate your building for its ability to withstand that wind speed and consider building shelters or safe rooms. Work with an architect, take a look at what the building code requires the building to be designed to, and then take a look at the tornadic force winds and consider that. I'll give you an example later in this presentation.

So, when I present this slide to conferences, I ask them, “What do you see?” Now, this is from a May 2013 EF5 tornado that hit Moore, Oklahoma, destroying two schools, including K through 12. The schools were fully occupied by students, teachers, and staff who had to shelter in place without storm shelters. Ask yourself, what do you see in this picture? Well, many people will say the books are still on the bookshelf. I'll say, yeah, and the bookshelf is still there. But we can also see the impact marks of debris made on the interior walls. Pieces of brick, concrete, roofing materials, shards of glass, broken glass impacting these walls at 215 mph. This is an interior corridor space. Notice the roof is gone, the ceilings are gone, loose concrete blocks. What would happen to children sheltering in the corridors during this event? Even in states like Kansas and Florida, the state emergency plan directs schools that don't have shelters to shelter children in place in interior rooms or corridors.

Let's look at another example. This is a daycare facility. This facility was hit by an EF3 tornado, with wind speeds of only 140 mph, that hit Selma, Alabama in January of this year. Seventy-two children were in this daycare center when the tornado struck. Staff quickly ushered the children into two restrooms in the center of the building. The infants in evacuation cribs were the last ones to get there, and there was no room in the restrooms for them. Now, I have to pause and ask, “Was this rehearsed? Why wasn't this known ahead of time?” It wasn't. The staff threw their bodies on months-old infants, at the very last moment as a tornado struck the building in an interior office. The roof came off, the walls caved in, and the ceiling came down. Out of this event, only one child, a four-month-old girl, walked away with a cut on her arm. There were no other injuries. No one could have predicted that this much damage, that there weren't fatalities.

The only thing I can think of as an engineer is that this roof came down on the restrooms and protected those restrooms from wind and flying debris. The building would have had to comply with a building code wind speed of 120 mph, modern building code. Now, I don't know when this building was constructed, it may not have been designed for 120, but today it would have

to be designed for 120. Sorry. However, it's in a wind speed zone for tornadoes of 200 mph. It's designed for 120. It could experience up to 200-mile-an-hour tornadoes. I assume the building predated the building codes for tornadic wind zones. It would have been exempt from needing one, even if it had been built under the modern code, because the code exempts daycare facilities and child care facilities. Now, this incident emphasizes the need for storm shelters or safe rooms and rehearsing emergency shelter-in-place drills. The facility failed and collapsed in an uncontrolled and chaotic manner during the storm event. This facility did not in itself protect the children. The staff did. The facility did not.

The last slide of tornado damage to comprehend. Again, back in May 2013, when the EF5 struck Moore, Oklahoma . A third-grade class was in this back room, and they were instructed to shelter in place in the hallway. The reinforced concrete block wall fell on the third graders. Thirteen were injured, and seven died. Safe rooms designed for 250 mph force winds were not available for these third graders. They had no safe room to shelter them. Since this disaster, in Moore, Oklahoma, over 2,000 schools in the United States have installed safe rooms and backfitted them to protect their children. We'll look at what safe rooms are in a few moments, and in later sessions, we can discuss the process and design of possible safe rooms, and that's highlighted in our guide.

I will say before we leave this slide, that the International Building Code requires storm shelters for K through 12 schools with occupants of 50 or greater. But the Building Code exempts child care centers from these codes. Why? I can't tell you. I have tried to find the reason for that. It could be economics. I don't know, but child care centers are exempted.

Let's take a look at a map now put out by the National Storm Shelter Association and the International Code Council, ICC. What this map shows us … And by the way, we're now entering that preventative mindset. It's a very large topic area, and we will only touch lightly on it with a few examples and some summary slides. I encourage you to fully read the Natural Disaster Guide for Head Start Facilities to learn more about preparedness.

You cannot design a building economically to withstand an EF4 or 5 tornado. I have seen reinforced concrete homes in southern Florida. I have toured the hurricane-destroyed areas down there. That's about it – not entire schools or child care facilities. If you want to protect the life safety from the most intense tornadoes, it's more economical and feasible to build a storm shelter or safe room within your facility. What this map shows us is the design criteria for those safe rooms. The building code does require schools greater than 50 people occupancy – in 250-mile-an-hour category, the dark red in the central part of the country – does require them to build safe rooms.

For instance, Owensboro, Kentucky is within the 250-mile-an-hour wind zone speed. Owensboro, the normal building code would require them to design a building to 116 mph, generally based on hurricane-strength winds. But because of this tornado map overlay, they have to build a safe room … The building can be designed 116 … They have to design a safe room to 250. The orange area, 200 mph, are not required to build safe rooms.

Here are some examples of safe rooms. These are prefab units. There are many different types that can be fitted into a classroom. You can program these. Because of Head Start, you have to be occupied. You have to have a teacher there, instructor, supervising. This is the one. On the right is a FEMA safe room. It's a reinforced masonry-block safe room. This is a great example of a safe room for a school. It's a cafeteria. It costs $1 million more to build than what a normal cafeteria would cost, and funding was provided through the Office of Head Start – reinforced masonry block walls, reinforced concrete ceiling, and they have refrigeration of food.