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Best Protection from Fierce Tornado Winds is Specially Designed Safe Room, Says UD Engineer

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NEWS RELEASE

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DAYTON, Ohio — A tornado warning is issued so you head to the basement, maybe even the southwest corner, where it's safest.

Well, no.

The best place to be during a tornado warning, according to the Federal Emergency Management Agency, is in a specially constructed "safe room" that is engineered to not come apart, overturn, slide or lift up.

"As important, it must be able to sustain a missile hitting that shelter," said Joseph E. Saliba, professor of civil and environmental engineering and engineering mechanics at the University of Dayton. "Two-by-fours, steel pipes, trash cans and sometimes even objects as big as cars become missiles in the high winds of a tornado. In an F4 or F5 tornado, you're not going to have a house above you to protect you from that."

Tornadoes are ranked according to the destruction they cause. The scale ranges from F0 for light damage from winds of 40 to 72 mph to F5 for incredible damage by winds of 261 to 318 mph.

Ohio falls into the high-risk category of tornado zones because, although infrequent, the tornadoes that touch down in the state tend to have strong winds. The deadly F4 twister (207-260 mph) that hit Van Wert on Nov. 10, 2002, sent cars tumbling into a destroyed movie theater and leveled buildings and trees. Saliba chaired the investigative team in Van Wert for the Masonry Society, the association that recommends masonry building code standards in the United States.

"Statistics show that two-thirds of major devastation has to do with wind rather than earthquakes or fire," Saliba said. "Hurricanes, tornadoes and tropical storms do most of the damage."

In new construction, a safe room can be incorporated in a basement, bathroom or roomy closet. Costs can range from $2,500 to $6,000, depending on the type of foundation, size and

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location of the shelter. In existing homes, a safe room can be installed or constructed in the same spaces or created outside the house as a lean-to. Costs run about 20 percent higher than shelters built in new construction. Underground safe rooms are also offered by manufacturers for installation in outdoor areas not prone to flooding.

Quick access is important, Saliba said, because tornado warnings often come at the last minute.

Saliba recommends reinforced concrete or reinforced masonry for safe room materials, and a kit of insulated concrete forms has lately become available for contractors to use. Saliba's third choice would be a timber wall with double the 2x4s (every 16 inches on center) and a sandwich of two sheets of 3/4-inch plywood and a sheet of metal 14 gauge or stronger to protect against flying debris.

Construction plans are available through FEMA, and the designs can be built by most residential contractors.

Saliba consulted on the designs when they were developed, initially intended for use in areas plagued by hurricanes. He has since designed shelters for community buildings, such as nursing homes and senior citizen centers, and is training the next generation of engineers to prevent catastrophes. He instituted a multi-hazard building design project where undergraduate students at UD design structures to withstand flood, fire, wind and earthquakes. It's one of a few such projects in a U.S. university curriculum, he said.

Designing a building to withstand wind "is the ultimate test for an engineer," Saliba said. "You have to design for wind from every direction because if there is a weak link, wind will find it. And once it finds its way inside, you're going to have problems. Garage doors are the biggest problem. If you have a three- or four-car garage, that's almost a sure sign wind will get into the house."

Although tornadoes are primarily a spring weather phenomenon, they can strike in any month of the year.

The idea that the southwest corner of a basement is the safest ranks with other misperceptions about tornadoes, such as the myth that residents should open windows on the north side of the house, Saliba said. "The path of a tornado is usually from the southwest to the northeast, but the wind that hits a structure is constantly swirling and will hit the building from every direction. So the southeast corner isn't safer than any other.

"And don't worry about the windows. The tornado will take care of them."

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