

Storm Shelters: Selecting Design Criteria



FEMA

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Purpose and Intended Audience

The intended audience for this Tornado Recovery Advisory is anyone involved in the planning, policy-making, design, construction, or approval of shelters, including designers, emergency managers, public officials, policy or decision-makers, building code officials, and home or building owners. Homeowners and renters should also refer to the Tornado Recovery Advisory titled *Residential Sheltering: In-Residence and Stand-Alone Shelter*. The purpose of this advisory is to identify the different types of shelter design guidance, code requirements, and other criteria that pertain to the design and construction of shelters for tornadoes and hurricanes. There are various storm shelter criteria, each of which offers different levels of protection to its shelter occupants.

This Recovery Advisory Addresses:

- How shelter construction is different from typical building construction
 - Structural systems
 - Windborne debris resistance
- Design criteria for different types of shelters
- Shelter considerations
- Useful links and shelter resources

See these 2007 Tornado Recovery Advisories for information about tornado risk, sheltering from tornadoes, and improving manufactured homes against damage from high winds:

- Tornado Risks and Hazards in the Southeastern United States (Tornado Recovery Advisory No. 1)
- Residential Sheltering: In-Residence and Stand-Alone Shelters (Tornado Recovery Advisory No. 3)
- Understanding and Improving Performance of Older Manufactured Homes in High-Wind Events (Tornado Recovery Advisory No. 4)
- Understanding and Improving Performance of New Manufactured Homes in High-Wind Events (Tornado Recovery Advisory No. 5)

How Shelter Construction is Different from Typical Building Construction

A shelter is typically an interior room, space within a building, or an entirely separate building, designed and constructed to protect its occupants from tornadoes or hurricanes. Shelters are intended to provide protection against both wind forces and the impact of windborne debris. The level of occupant protection provided by a space specifically designed as a shelter is intended to be much greater than the protection provided by buildings that comply with the minimum requirements of building codes. The model building codes do not provide design and construction criteria for life safety for sheltering nor do they provide design criteria for tornadoes.

Shelters typically fall into two categories: residential shelters and community (non-residential) shelters.

- There are two general types of residential shelters: in-residence shelters and shelters located adjacent to, or near, a residence. An *in-residence shelter*, also called a “safe room,” is a small, specially designed (“hardened”) room, such as a bathroom or closet that is intended to provide a place of refuge for the people who live in the house. An *external residential shelter* is similar in function and design, but it is a separate structure installed outside the house, either above or below ground. Refer also to the Tornado Recovery Advisory titled *Residential Sheltering: In-Residence and Stand-Alone Shelter*.

The term “hardened” refers to specialized design and construction applied to a room or building to allow it to resist wind pressures and windborne debris impacts during a high-wind event and serve as a shelter.

