



Saving Lives through Storm Shelters and Safe Rooms

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New Editions of ICC 500 Storm Shelter Standard and FEMA Safe Room Guidance

- ICC 500 (Second Edition) released in December 2014
- FEMA P-361 (Third Edition) released in March 2015
- FEMA P-320 (Fourth Edition) released in December 2014







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Outline


- Storm Shelter and Safe Room Terminology
- FEMA publications background
- ICC 500
- 2015 IBC storm shelter code changes
- FEMA P-361
- FEMA P-320
- Success stories



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Terminology




- **ICC 500 Storm Shelter** – A building, structure, or portion(s) thereof, constructed in accordance with ICC 500, for the purpose of providing safe refuge from storms that produce high winds, such as tornadoes and hurricanes
 - **Residential Storm Shelter** - Serves occupants of dwelling units and has an occupant load not exceeding 16 persons
 - **Community Storm Shelter** - Any storm shelter not defined as a residential storm shelter
- **FEMA Safe Room** – A building, structure, or portion(s) thereof, constructed in accordance with FEMA P-320 or FEMA P-361, which uses ICC 500 as a referenced standard and also specifies Recommended Criteria that is slightly more conservative than ICC 500



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FEMA Safe Room Publication Background




- FEMA technical building science teams observe and assess building performance after disasters of national significance in the United States
- Post-disaster studies have been conducted since the 1970s to determine safe room design
- FEMA has provided technical guidance on tornado protection since 1980, in TR-83A in 1998
- over 1 million copies of FEMA P-320 have been distributed since the first edition in 1998

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FEMA-Funded Safe Room Grants

- FEMA's recommended guidance in P-320 and P-361 are **requirements** for FEMA grants
 - Over \$985M in Federal funds granted to design and construct safe rooms
 - Nearly 25,000 residential safe rooms
 - Over 2,000 community safe rooms
 - In 25 states and territories

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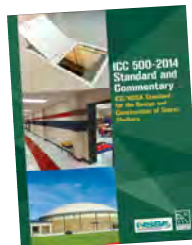
ICC 500, Standard for the Design and Construction of Storm Shelters



- First released in 2008
- ICC 500 took much of what was presented in the first edition of FEMA P-361 and updated and codified it
- Referenced by the 2009, 2012, and 2015 International Building Code® and International Residential Code®



ICC 500 Commentary



- Released in February 2016
- Provides background information and useful insight on the code



New 2015 IBC Code Requirement for ICC 500 Storm Shelters

423.3 Critical emergency operations. In areas where the shelter design wind speed for tornadoes per Figure 304.2(1) of ICC 500 is **250 MPH**, **911 call stations, emergency operation centers and fire, rescue, ambulance and police stations shall have a storm shelter** constructed in accordance with ICC 500



New 2015 IBC Code Requirement for ICC 500 Storm Shelters

423.4 Group E occupancies. In areas where the shelter design wind speed for tornadoes is **250 MPH** per Figure 304.2(1) of ICC 500, **all Group E Occupancies with an aggregate occupant load of 50 or more shall have a storm shelter** constructed in accordance with ICC 500. The shelter shall be capable of housing the total occupant load of the Group E occupancy.

- Exceptions:**
1. Group E day care facilities.
 2. Group E occupancies accessory to places of religious worship.
 3. Buildings meeting the requirements for shelter design in ICC 500.



ICC 500 Purpose (Section 101.1)

The purpose of this standard is to establish minimum requirements to safeguard the public health, safety and general welfare relative to the design, construction and installation of storm shelters constructed for protection from high winds associated with tornadoes and hurricanes....



Storm Shelter Design Wind Speeds for Tornadoes (ICC 500 Figure 304.2(1))



Storm Shelter Design Wind Speeds for Hurricanes (ICC 500 Figure 304.2(2))



FEMA P-361 Safe Room Guidance



Safe Rooms for Tornadoes and Hurricanes: Guidance for Community and Residential Safe Rooms (2015)

- Detailed design and construction criteria for hurricane and tornado safe rooms
- Community **and residential** safe rooms
- Uses ICC 500 as a Referenced Standard
- Emergency management considerations not found in ICC 500



FEMA P-361 Reorganized

Decision Makers and Emergency Management Considerations

Part A


- A1: Purpose & Background
- A2: Extreme-Wind Risk Assessment and Analysis
- A3: Costs and Benefit-Cost Analysis
- A4: Operation & Maintenance Considerations for Community Safe Rooms

Design Professionals (same chapter sequence as ICC 500)

Part B

- B1: Application & Administration
- B2: Definitions
- B3: Structural Design
- B4: Siting
- B5: Occupancy, Means of Egress, Access and Accessibility
- B6: Fire Safety
- B7: Essential Features & Accessories
- B8: Test Methods for Impact and Pressure Testing


FEMA Recommended Criteria that is more conservative than ICC 500 is presented in a table at the beginning of each chapter and in Appendix D



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APPENDIX D Comparison Matrix of Differences Between ICC 500 Requirements and FEMA Recommended Criteria

ICC 500 REFERENCE	ICC 500 REQUIREMENTS FOR STORM SHELTERS	FEMA RECOMMENDED CRITERIA FOR SAFE ROOMS
Section 102.1 General	Where required by the authority having jurisdiction, construction documents shall be prepared. Such documents shall contain information as required by the applicable building code and this section.	For all safe rooms construction documents shall be prepared and maintained. Such documents shall contain information as required by the applicable building code and this section.
Section 102.2 Design Information	For the areas of a building designed for occupancy as a storm shelter, the following information shall be provided within the construction documents: 2. A statement that the wind design conforms to the provisions of the ICC-ES ESR-1857 for the Design and Construction of Storm Shelters, with the edition year specified.	2. A statement that the wind design conforms to the provisions of the ICC-ES ESR-1857 for the Design and Construction of Storm Shelters, with the edition year specified and to the provisions of FEMA P-361, with the edition year specified.
Section 304.2 Design Wind Speed	For tornado shelters, the design wind speed shall be in accordance with Figure 304.2(1). For hurricane shelters, the design wind speed shall be in accordance with Figure 304.2(2).	For all residential safe rooms, the design wind speed shall be 150 mph, regardless of location.




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FEMA P-320 Safe Room Guidance



Taking Shelter From the Storm: Building a Safe Room For Your Home or Small Business (2014)

- Understanding the Hazards, and Accessing Risks
- Safe Room Decision Guidance
- Construction Plans for **residential** safe rooms that hold 16 or fewer occupants
- Plans based on design criteria in FEMA P-361 and ICC 500



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Safe Room Success Stories






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Questions

For questions pertaining to FEMA safe room guidance publications, please contact the Safe Room Helpline at Saferoom@fema.dhs.gov

Additional FEMA Building Science resources can be found at <http://www.fema.gov/building-science>



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