Safe Room Standards and Guidelines - 2015
Applications

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Outline
- A brief trip down memory lane
- Discuss relevant safe room standards and guidelines
  - NSSA/ICC 500; FEMA P 320; FEMA P 361; ASCE 7-10
  - 2014 revisions
- Applications – who’s using them
- Some of the major programs, advancements in safe room programs

Oklahoma 1999

The concept arrives - 1972
Burnett, Texas

The First Standard
An industry standard
National Storm Shelter Association (NSSA) Standard
for the Design, Construction, and Performance of Storm Shelters
2001

A forerunner for
ICC 500-2014
ICC/NSSA Standard for the Design And Construction Of Storm Shelters
Succeeds ICC/NSSA - 2008
NSSA/ICC Commentary in preparation
Relevant Standards and Guidelines

- FEMA 361
- FEMA 320
- ICC-500
- ASCE 7-10
- I-Codes

FEMA 361
- FEMA 361 contains criteria very similar to FEMA 361, with few minor differences where 361 is more stringent
- Is referenced by FEMA 361 for certain technical criteria
- This standard is intended for adoption by government agencies and organizations setting model codes

ICC 500
  - Contains criteria very similar to FEMA 361, with few minor differences where 361 is more stringent
  - Is referenced by FEMA 361 for certain technical criteria
  - This standard is intended for adoption by government agencies and organizations setting model codes

Major changes in 2014 edition

- Anchor Installation
  - Post-installed anchors in hardened concrete and masonry require a special inspection
  - This inspection verifies:
    - Anchor installation
    - Capacity and foundation adequacy
    - Foundation requirements
  - Exceptions:
    - This can be waived by an authority having jurisdiction for residential shelters

Construction documents shall undergo a peer review:
- Community shelters designed for greater than 50 occupants
- Schools and day care facilities greater than 16
- Storm shelters in Risk Category IV as per IBC

All NSSA shelters undergo an independent third-party review

Safe Room Publications

FEMA 320
- Taking Shelter From the Storm: Building a Safe Room For Your Home or Small Business (2014)
  - Prescriptive solutions for safe rooms that hold 16 or fewer individuals
  - Solutions are based on design criteria in FEMA 361
  - Includes drawings for safe rooms of different material types and a range of sizes

FEMA 320 continued
- Consumer Guide Section
  - Discusses how to select good safe room designers and contractors
  - Discusses how to determine if products from safe room manufacturers and installers meet the FEMA 320/361 safe room criteria*

* That has been NSSA purpose and goal throughout its history
FEMA P-320 Changes: Consumer Guidance and Door Selection

Guidance on purchasing prefabricated safe rooms
- Products should indicate compliance with FEMA P-361
- Test certification documents should be made available upon request
- Must be installed on adequate foundation

Door selection
- Where to find tested doors
- What to look for
- What questions to ask door manufacturers
- Why a tested door is so important

 NSSA/ICC 500-2014

- Changes available soon on NSSA website
  www.NSSA.cc
- Samples shown in following slides
  - NSSA & ICC will develop and publish a commentary to revised Standard; expected mid-2015

Door is Critical Element in Performance

Arkansas door failure resulted in fatality

Presentation on Tuesday emphasized door selection

Copy of demo report at NSSA booth or on web at www.NSSA.cc

Section 305.1.2

2008
305.1.2 Missile criteria for hurricane shelters. The test missile shall be a 9 pound sawn lumber 2x4. The speed of the test missile impacting vertical shelter surfaces shall be a minimum of 0.40 times the shelter design wind speed.

2014
305.1.2 Missile criteria for hurricane shelters. The speed of the test missile impacting vertical shelter surfaces shall be a minimum of 0.50 times the shelter design wind speed. This is the most conservative approach and will coincide more with FEMA P-361.

FEMA P-320 Changes: Seismic Considerations

Incorporating seismic risk into the considerations

Section 304.9 (new)

2014
304.9 Storm shelters connected to host buildings. Where an element or component of the host building is connected to a storm shelter, the storm shelter shall be designed to resist the maximum force that could be transmitted to the shelter equal to the ultimate failure strength of the connection or element being connected, whichever is lower, concurrent with the other wind loads on the storm shelter required by Chapter 3.

This ensures any components or items attached to the storm shelter will not impose a load that would compromise the integrity of the storm shelter.
Sanitation Facility Requirements

P-361
• 2008 – 2 toilets for all community
• 2014 – references ICC 500-2014

ICC 500-2014
• Tornado community: Toilet facilities requirement for community (> 50 occupants), 2 minimum for the first 500 occupants and 1 additional per 500 occupants or portions thereof

Temporary and chemical toilets are allowed to meet criteria beyond code requirements

Safe Room Publications: FEMA P-361
• Design and Construction Guidance for Community Safe Rooms (2008)
• Community and residential
• Detailed design and construction criteria for hurricane, tornado, and combined safe rooms
• Risk assessment
• Emergency management aspects

Special Inspections, Compliance Verification
• Special inspections will be required of anchors post-installed in hardened concrete and masonry
• May be waived if Authority Having Jurisdiction (AHJ) verifies that anchorage complies with standards-required construction documents, e.g., Quality Assurance Plan
• NSSA Producer Member or Authorized Representative performs inspection per the Quality Assurance Plan, completes Inspection Report including Installation Checklist
• NSSA Safe Room Compliance Verification Process is aimed at obviating the need for special inspections

Steps in NSSA Compliance Verification
1. Tested for debris impact resistance
2. Design drawings and specifications
   1. Sealed by design professional
   2. Includes Quality Assurance Plan (QAP)
3. Design & QAP approved by independent, NSSA-approved Third Party Engineer
4. Producer Member or Installer Member
   1. Affixes NSSA Seal
   2. Files Certificate of Completion

ICC 500-14 Revisions to be Incorporated in Update to P-361 (2015)
• Definition of Community vs Residential
• Flood Elevation
• Special inspection for post-installed anchors
• Residential shelter proximity to home (150ft)
• Peer review chapters expanded, and required for Risk Category IV shelters
• Labeling
• Door undercut, joints/gaps/voids

FEMA Safe Rooms by the Numbers for HMGP and PDM
FEMA 361 required
Best available data as of late 2014:
• Total funds obligated for safe rooms
  ▪ Over $928M (Federal share)
  ▪ 2,300+ community safety room projects
  ▪ 25,000+ residential and safe rooms
• Provided for 25 states and territories
• Whenever a safe room is constructed with FEMA grant funds, the FEMA recommended criteria become requirements in addition to the requirements of ICC 500
**Applications and Uses 2015 IBC**

**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.

**Exception:** Buildings meeting the requirements for shelter design in ICC 500.

**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.

**Users**

**States**

- Alabama
- Illinois

- State laws that require that new schools provide safe rooms
- Some existing schools feel pressure to compete

**Users**

**Oklahoma**
- SoonerSafe
  - 10,000 safe rooms since 1999
  - 75% FEMA up to $2,000
  - Lottery system
  - Estimated 3-4 times # shelters funded by FEMA in Moore
- Universities and schools
  - University of Oklahoma (current)
  - Northeastern State University
  - Many schools and local projects
- Safe Schools 101
  - Defining best available space: interim measure
  - Sixteen workshops offered in OK
  - Two in Arkansas

**Texas**
- Residential safe rooms
  - More than 5,000 built
  - Primarily in Panhandle
  - Reimbursed 50% of cost up to $3,000
- Community shelters
  - Will have about 80 large shelters - largest 28,000 ft²
  - 407 StormReady supporters

**States in FEMA Region 6**

- Arkansas
- Oklahoma
- Texas
- New Mexico
- Louisiana

- City of Tulsa began years ago under FEMA Project Impact and Ann Patton to become a Disaster Resistant City.
- Recently built school library/storm shelter

**NOAA - NWS StormReady designees**

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<thead>
<tr>
<th>National</th>
<th>States in FEMA Region 6</th>
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<tbody>
<tr>
<td>2489 StormReady sites in 49 states</td>
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<tr>
<td>1052 counties/17 parishes</td>
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<tr>
<td>861 communities</td>
<td></td>
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<tr>
<td>154 universities</td>
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<tr>
<td>17 Indian Nations</td>
<td></td>
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<tr>
<td>85 commercial sites</td>
<td></td>
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<tr>
<td>83 military sites</td>
<td></td>
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<td>36 government sites</td>
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<td>407 StormReady supporters</td>
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**Progress of storm shelter industry, last 15 years Since 1999 OKC tornadoes**

- Developed standards and guidelines
  - ICC/NSSA 500, FEMA 320 and FEMA 361, ASCE 7-10, NSSA Standards-Compliance Verification Process
- Expanded number of shelter producers
  - Manufactured Site-built Community Above Ground
  - Concrete, steel, timber, CMU, ICF, fiberglass
- Expanded educational programs through FEMA, ICC, FLASH, NSSA
- Numerous workshops and seminars
- Presentations on ICC Campus Online
- Better informed, more involved building officials
For more information

www.FEMA.gov

www.NSSA.cc

If all else fails,
call

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