OVERVIEW OF FEMA BUILDING SCIENCES, THE MAT AND AVAILABLE RESOURCES

KAMM 2019
Barkley State Park, KY
September 17th, 2019

John Plisich
Civil Engineer
FEMA RIV Building Sciences
Briefing Overview

- Overview of FEMA Buildings Sciences
- FEMA MAT’s critical Role
- Select FEMA Building Science Resources
  - Wind
  - Flood
- FEMA Building Science engagement w/ Codes and Standards
- Kentucky’s Building Code
- Select FEMA Building Code Resources
- Disaster Recovery Reform Act (DRRA)
- Other select On-Going Building Science Efforts
- Other Select Building Science Resources
Overview of FEMA Building Sciences
Critical Role of FEMA Building Sciences

- Supports development, adoption & defending of building codes and standards
- Provide technical support internal / external to FEMA
- Develop multi-hazard mitigation guidance
- Conduct post-disaster building performance assessments and support services
- Conduct education and outreach
- Force Multiplier, often Behind the Scenes
Building Science Branch Brochure

Concise Overview Handout

- What is Building sciences?
- Building Codes
- Earthquakes
- High Wind
- Floods
- Other Hazards
- FEMA Building Science Library
- Provides key web links to important resources
FEMA MAT’s
Critical Role
FEMA MATs critical role as feedback loop - Field to Practice

Mitigation Assessment Team Program

- Evaluate post-disaster building performance and develop recommendations that:
  - Improve codes/standards/materials
  - Identify gaps in knowledge, testing, research
  - Promote best practices and successes
  - Provide guidance for homeowners, design professionals, code officials, local/state officials, building owners & operators, decision makers, FEMA, Non-profits, OFA’s, others as needed
FEMA MATs critical role as feedback loop - MAT Reports

- H Andrew (1992);  H Iniki (1992)
- H Opal (1995);  Oklahoma City (1995)
- Fran (1996);  Georges (2) (1998)
- Isaac (2012);  H Sandy (2012)
- 2017 Hurricanes (USVI, PR, TX, FL)
- H. Michael (2018) (FL); in progress

Available for download:

web search, “FEMA MAT”

*Dates above are when event occurred, not report date*
FEMA MATs critical role as feedback loop
Guidance & Best Practice Docs

- New or revised resources from Observations, conclusions, and recommendations from 25 years of MAT findings and other source inputs
  - FEMA P-55 Coastal Construction Manual (CCM)
  - FEMA P-259 Engineering Principles and Practices for Retrofitting Flood Prone Structures
  - FEMA 348 Protecting Building Utility Systems From Flood Damage
  - FEMA P-1019; Emergency Power Systems for Critical Facilities; A Best Practices Approach for Improving Reliability
FEMA MATs critical role as feedback loop - MAT Recovery Advisories (RA’s)

- Provides timely tech guidance for recovery operations
- Published 67 RA’s
  
  - 2004 Hurricane Charley (3)
  - 2004 Hurricane Ivan (4)
  - 2005 Hurricane Katrina (8)
  - 2008 Hurricane Ike (8)
  - 2007 Tornadoes in FL (4)
  - 2011 Tornadoes (8)
  - 2012 Hurricane Sandy (7)
  - 2013 Hurricane Isaac (2)
  - 2016 Iowa Flooding (5)
  - 2017 Hurricanes (16)
  - 2018 Hurricanes (2)

* Event dates, not published RA dates

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**Figure 1: Example of residential building with two roof sections**

**Figure 2: Example of non-residential building with four roof sections**

FEMA MAT H. Irma FL RA 2; Mitigation Triggers for Roof Repair and Replacement in the 6th Edition (2017) Florida Building Code; May 18
Primary audience:
- anyone involved in the planning, policymaking, design, construction, or approval of safe rooms and storm shelters. This includes designers, emergency managers, public officials, policy- or decision-makers, building officials, and home- or building owners.

Provides:
- Key issues
- Safe Rooms and Storm
- Selecting BARA in Buildings
- Design Professional Liability Concerns
- Operational Considerations for Safe Rooms and Storm Shelters During Events
Primary audience:
- Building owners, operators, and managers; installers; and contractors
- also helpful for A/E’s, planners, local gov & building code officials

Provides:
- Observations related to dry floodproofing system ops
- Ops, maintenance, and testing plans for dry floodproofing systems
- Deployment considerations for active dry floodproofing
- Floodproofing considerations for a facility EOP
Primary audience:
- Building owners, operators & managers; architects; engineers; building officials; contractors and local gov officials

Provides:
- Observations of dry floodproofing system failures
- Flood vulnerability assessments
- Planning and pre-design considerations
- Design considerations

H. Harvey FEMA MAT TX RA-1: Dry Floodproofing: Planning & Design

Dry Floodproofing: Planning and Design Considerations

Purpose and intended Audience

The purpose of this Recovery Advisory is to provide guidance on the design of dry floodproofing measures to reduce flood damage and limit interruption of building services. This advisory incorporates observations made by the Federal Emergency Management Agency (FEMA) Mitigation/Recovery Teams [MRTs] in Texas and Florida after Hurricane Harvey and Irma. It describes best design practices and successful implementation of dry floodproofing, as well as common lessons learned from failures. The information in this advisory is directed toward existing and new non-residential facilities.

This guidance, along with other FEMA publications related to dry floodproofing, should be used by building owners and design professionals examining ways to reduce flood risk. It is also useful to communities and building owners preparing designs and proposals for FEMA.

Section 406 Hazard Mitigation grants and hazard mitigation elements included in recovery funding available through FEMA Section 408 Public Assistance to improve resiliency in future flooding events. Lessons learned and best practices from these MRTs can be incorporated into new designs when planning and designing floodproofing systems for new buildings.

The guidance reflects the advisory’s considerations, standards, and recommendations for new buildings.

Key Issues

The key issues identified by the MRTs during field visits in Texas and Florida are shown in Table 1. A number of these key issues are addressed in detail in other FEMA publications (see the list of references and resources in this advisory) and not in this advisory. This advisory focuses on key lessons to help reduce flood risk in new buildings.
Fact Sheet: Mitigation Assessment Teams

- Provides an overview of the MAT
  - Assessing Damages with an eye to the future
  - Consensus Recommendations for Building Stronger and Safer
  - Information for the pub

- 2016

Mitigation Assessment Teams
Building Stronger and Safer

The Federal Emergency Management Agency’s (FEMA’s) Mitigation Assessment Teams (MATs) conduct engineering analyses after major natural disasters to assess damage to government facilities, homes, businesses, and other structures, and to determine the causes of structural failures and successes. Based on a comprehensive analysis of data, MATs prepare recommendations for construction codes and standards, building design issues, and best practices. The program works in collaboration with State and local governments, and draws on a wide range of technical expertise from the private sector.

Upon conclusion of the field investigation, specialists work as a team to analyze the field data, as well as other damage reports and studies conducted by government agencies or private firms. The team then prepares conclusions and develops recommendations about appropriate construction methods. Once consensus is reached, FEMA issues a series of “Recovery Advisories.”
Select FEMA Building Science Resources
FEMA Select Wind Mitigation Resources
Public Buildings

- FEMA Resources Available for Wind Mitigation of Public Buildings:
  - FEMA P-361 Safe Rooms for Tornadoes and Hurricanes
  - FEMA P-424 Design Guide for Improving School Safety in Earthquakes, Floods, and High Winds
  - FEMA 543 Design Guide for Improving Critical Facility Safety from Flooding and High Winds
  - FEMA 577 Design Guide for Improving Hospital Safety in Earthquakes, Floods, and High Winds
FEMA P-361 Safe Rooms for Tornadoes and Hurricanes: Guidance for Community and Residential Safe Rooms

- Provides recommended criteria and best practices, while ICC 500 is a minimum standard
- Safe rooms constructed with FEMA grant funds are required to adhere to FEMA Recommended Criteria described at the beginning of Part B chapters as well as the corresponding ICC 500 requirements
FEMA Wind Mitigation Resources
FEMA P-424 Schools

- FEMA P-424 Design Guide for Improving School Safety in Earthquakes, Floods, and High Winds
  - Provides a checklist for building vulnerability of schools exposed to high winds

<table>
<thead>
<tr>
<th>Vulnerability Sections</th>
<th>Guidance</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Envelope (cont.)</td>
<td>Section 6.3.3</td>
<td></td>
</tr>
<tr>
<td>Are there existing sectional or rolling doors?</td>
<td>Older doors often lack sufficient wind resistance.</td>
<td></td>
</tr>
<tr>
<td>Does the existing building have large windows or curtain walls?</td>
<td>If an older building, evaluate their wind resistance.</td>
<td></td>
</tr>
<tr>
<td>Does the existing building have exterior glazing (windows, glazed doors, or skylights)?</td>
<td>If the building is in a hurricane-prone region, replace with impact-resistant glazing, or protect with shutters.</td>
<td></td>
</tr>
<tr>
<td>Does the existing building have operable windows?</td>
<td>If an older building, evaluate its wind-driven rain resistance via ASTM E 1105.</td>
<td></td>
</tr>
<tr>
<td>Are there existing exterior non-load-bearing masonry walls?</td>
<td>If the building is in a hurricane- or tornado-prone region, strengthen or replace.</td>
<td></td>
</tr>
<tr>
<td>Are there existing brick veneer, EIFS, or stucco exterior coverings?</td>
<td>If the building is in a hurricane-prone region, evaluate attachments. To evaluate wind resistance of EIFS, see ASTM E 2359.</td>
<td></td>
</tr>
<tr>
<td>Are existing exterior walls resistant to wind-borne debris?</td>
<td>If the building will be used as a hurricane evacuation shelter, but was not designed and constructed in accordance with FEMA 361, consider enhancing debris resistance.</td>
<td></td>
</tr>
</tbody>
</table>
FEMA 543 Design Guide for Improving Critical Facility Safety from Flooding and High Winds

- Assist owners and decision makers in considering:
  - Types of Building Damage
  - Ramifications of Damage
- Provides Best Practices in
  - Hurricane-Prone Regions
  - Tornado-Prone Regions
FEMA Wind Mitigation Resources
FEMA 577 Hospitals

- FEMA 577 Design Guide for Improving Hospital Safety in Earthquakes, Floods, and High Winds
- Provides recommended practices for roof replacements
FEMA Wind Mitigation Resources
Residential Buildings

- FEMA Resources Available for Wind Mitigation of Residential Buildings:
  - FEMA P-320 Taking Shelter from the Storm
  - FEMA P-804 Wind Retrofit Guide for Residential Buildings
FEMA P-320 Taking Shelter from the Storm

- Provides planning requirements
  - Design basis
  - Flood hazard siting and elevation
  - Safe room size
  - Safe room locations
  - Safe room doors
  - Foundation type
  - Construction Materials
FEMA Wind Mitigation Resources
FEMA P-804 Wind Retrofit Guide

- FEMA P-804 Wind Retrofit Guide for Residential Buildings
  - Identifies wind risks for a particular site or area
  - Describes the evaluation process used to evaluate a building for vulnerability to wind events
  - Helps select appropriate and feasible wind mitigation measures
  - Implement residential building wind retrofit mitigation projects
    - Basic, intermediate and advanced packages
FEMA P-85: Protecting Manufactured Homes from Floods and Other Hazards

- NFIP and HUD code requirements
- FEMA test programs:
  - Ground anchors
  - Dry-stacked & bonded CMU piers
- Foundation recommendations based on flood zones and flood velocities
- Proprietary foundation designs to resist flood, wind and seismic loads
Residential Flood Retrofitting Measures

Mitigation types discussed:

- Elevation
- Relocation
- Floodwalls and levees
- Dry floodproofing
- Wet floodproofing

- Third Edition January 2012
FEMA P-348
Protecting Building Utility Systems

- Introduction – Building Systems and Flood Hazards
- Compliance and Mitigation Measures
- Mitigation Measures for Residential Buildings
- Mitigation Measures for Non-Residential Buildings
- 2nd Ed Feb 2017
Non-Residential Floodproofing

- **Goals:** Provide engineering design and economic guidance to those involved in planning and implementing floodproofing projects
- **Primary focus on dry floodproofing design considerations and measures**
- **Addresses other floodproofing measures (wet floodproofing, flood barriers, emergency measures)**
- **July 2013**
Substantial improvement / Substantial Damage Desk Reference

- NFIP Roles and Responsibilities
- SI / SD Requirements & Definitions
- Making SI / SD Determinations
- Administering SI / SD Requirements
- Factors to Consider and Illustrations of SI and Repair of SD
- SD in the Disaster Recovery Environment
- Mitigation Projects
FEMA 213, Answers to Questions About Substantially Damaged Buildings

- Previous version was from 1991
- Guidance on how to properly determine if a building is substantially damaged in accordance with the NFIP regulations.
- Four major sections
  - Improved Introduction for better context
  - Definitions, Regs and General Questions
  - How to Determine SI and SD
  - Post Disaster Permitting
- August 2018
FEMA Building Science engagement w/ Codes and Standards
Coordinating the I-Codes and the NFIP

NFIP Regulations (44 CFR Parts 59 & 60)

Local Floodplain Management Regulations*

Building Code

Hazard Resistant Buildings and Development

ASCE 7

ASCE 24

* NFIP-consistent administrative provisions and technical requirements for development outside the scope of the building code (and higher standards, in some communities).
Coordinating I-Codes and Ordinances

- Includes crosswalks of 2009 and 2012 I-Codes to NFIP regulations
- Includes model code-coordinated ordinances and sample plan review and inspection checklists
- Order hardcopy from FEMA warehouse or download from FEMA website ([http://www.fema.gov/media-library/assets/documents/96634](http://www.fema.gov/media-library/assets/documents/96634))
- Currently being updated
Codes and Standards Tracking

- Building Code Adoption Tracking (BCATS), 3rd Quarter 2019:
  - 33% of reporting jurisdictions adopted 2015 or later IBC/IRC
    - w/o weakening disaster-resistant provisions
  - Flood 44% (Shown on Map), Hurricane 56%, Earthquake 56%, Damaging Wind 59%; Tornado 27% Multi-Hazard 33%
Codes and Standards Engagement

• 2021 IRC and IBC Code change proposals
  • Of 15 FEMA flood/wind proposals: 13 approved, 2 disapproved.

• ASCE 7 and 24

• ICC-500

The adoption and enforcement of strong building codes and standards reduces damages
• Be Code Confident

https://inspecttoprotect.org

- Enter Street Address & Zip Code
- Code info will populate
Kentucky’s Building Code
• Kentucky Public Protection Cabinet
  – Department of Housing, Buildings and Construction
    • HBC enforces statewide standards for building construction
    • Agency ensures fire and life safety in existing buildings
    • licenses/certifies plumbers, electricians, boiler contractors, sprinkler and/or fire alarm contractors and building inspectors
    • http://dhbc.ky.gov
Kentucky Building Codes

• 2018 Kentucky Building Code, 2nd Edition w/ amendments
  – Based on the 2015 IBC
  – “mini/maxi” code; meaning statewide, uniform, mandatory building code and no local govt shall adopt or enforce any other building code governing commercial construction
  – Have not adopted IBC Appendix G Flood Resistant Construction

• 2018 Kentucky Residential Code, 2nd Edition, w/ amendments; Compliance Date 3 Aug 19
  – Based on the 2015 IRC
  – “mini/maxi” code; establishes min / max code requirements for detached single family dwellings, two-family dwellings and townhouses and no local government shall adopt or enforce any other building code on these units

• 2018 KBC & KRC effective 22 Aug 18; Mandatory eff date 1 Jan 19
  – Kentucky Amendments (2nd Ed of codes) became effective 3 Aug 19
Kentucky Other Codes in Effect

- Below is for reference of codes currently used in KY; Refer to Chap 35 of KBC & IBC for others
  - 2012 International Energy Conservation Code (for use with commercial buildings only)
  - 2009 International Energy Conservation Code (for use with residential buildings only - see definition in IECC)
  - 2009 ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities
  - Kentucky State Plumbing Law, Regulations & Code (815 KAR Chapter 20)
  - State Boiler Regulation (KRS 236, 815 KAR 15)
  - 2013 NFPA 13 - Installation of Sprinkler Systems
  - 2013 NFPA 13D - Installation of Sprinkler Systems in One-and Two-Family Dwellings and Manufactured Homes
  - 2013 NFPA 13R – Installation of Sprinkler Systems in Residential Occupancies Up to & Including 4 Stories in Height
  - 2013 NFPA 14 – Installation of Standpipe and Hose Systems
  - 2012 NFPA 54 - National Fuel Gas Code
  - 2017 NFPA 70 - National Electrical Code (effective October 1, 2014)
  - 2013 NFPA 72 - National Fire Alarm and Signaling Code
Select FEMA Building Code Resources
The IBC, IEBC, IRC and ICC 500 can be purchased at the International Code Council. ASCE/SEI 7 can be purchased from the ASCE Store.


This document summarize the wind-resistant provisions of the 2015 edition of the IBC.


This document summarize the wind-resistant provisions of the 2015 edition of the IEBC.

**Wind Provisions in the 2015 International Residential Code®** (February 2017)

This document summarize the wind-resistant provisions of the 2015 edition of the IRC.
CHAPTER 1
ADMINISTRATIVE

[A] 101.2 Scope. The provisions of this code shall apply to the construction, alteration, relocation, enlargement, replacement, repair, equipment, use and occupancy, location, maintenance, removal and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures.

Exception: Detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories above grade plane in height with a separate means of egress, and their accessory structures not more than three stories above grade plane in height, shall comply with the International Residential Code.
Highlights of ICC 500-2014, ICC/NSSA Standard for the Design and Construction of Storm Shelters

Published by the International Code Council (ICC), ICC/NSSA Standard for the Design and Construction of Storm Shelters (ICC 500), is a referenced standard in the International Codes (I-Codes) of the NationalStormShelter Association. In 2003, the National Storm Shelter Association, which had been formed in 2000 to develop disaster reduction standards for storm shelters, came together with the International Code Council (ICC) to develop a national standard to codify the design and construction of tornado and hurricane storm shelters. The standard was first published in 2004, and it was updated in 2008 to incorporate the latest research on wind pressure and design criteria for storm shelters. This standard is intended for use by agencies and organizations to achieve uniformity in the design and construction of storm shelters.

Source: ICC 500, Figure 304.2(h) used with permission

Figure 1: Shelter design wind speeds for tornadoes
Purpose of this Checklist. This checklist will guide floodplain managers, building officials and designers as they compare the requirements of the National Flood Insurance Program (NFIP) to the flood provisions of the 2018 edition of the International Building Code® (IBC), the International Mechanical Code® (IMC), the International Plumbing Code® (IPC), the International Fuel Gas Code® (IFGC), the International Residential Code® (IRC), the International Existing Building Code® (IEBC), and the referenced standard, ASCE 24-14 Flood Resistant Design and Construction. Most states adopt the IMC, IPC, and IFGC either separately or by reference in the IBC; some states adopt the Uniform Mechanical Code and the Uniform Plumbing Code which are published by the International Association of Plumbing and Mechanical Officials (IAPMO).

This checklist is based on the standard checklist used by FEMA and states to review local floodplain management regulations/ordinances to determine whether such regulations and ordinances are complete for the purpose of participating in the NFIP. Pertinent Federal regulations are in 44 CFR Part 60 (criteria for land management and use) and 44 CFR Section 59.1 (definitions).
FEMA Resources
ASCE 24 Highlight Fact Sheet

HIGHLIGHTS OF ASCE 24-14 Flood Resistant Design and Construction

Published by the American Society of Civil Engineers (ASCE), *Flood Resistant Design and Construction*, ASCE 24, is a referenced standard in the *International Codes®* (I-Codes®). ASCE 24 states the minimum requirements and expected performance for the siting and design and construction of buildings and structures in flood hazard areas that are subject to building code requirements. Types of buildings and structures are described in ASCE 24-14, Table 1-1 (see page 5 of these Highlights), and include commercial, residential, industrial, educational, healthcare, critical facilities, and other occupancy types. Buildings and structures designed according to ASCE 24 are

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### Minimum Elevation of Lowest Floor (Zone A: ASCE 24-14 Table 2-1)

<table>
<thead>
<tr>
<th></th>
<th>Flood Design Class 1</th>
<th>Flood Design Class 2</th>
<th>Flood Design Class 3</th>
<th>Flood Design Class 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone A not identified as Coastal A Zone</td>
<td>DFE</td>
<td>BFE +1 ft or DFE, whichever is higher</td>
<td>BFE +1 ft or DFE, whichever is higher</td>
<td>BFE +2 ft or DFE, or 500-year flood elevation, whichever is higher</td>
</tr>
</tbody>
</table>

### Minimum Elevation of Bottom of Lowest Horizontal Structural Member (Zone V: ASCE 24-14 Table 4-1)

<table>
<thead>
<tr>
<th></th>
<th>Flood Design Class 1</th>
<th>Flood Design Class 2</th>
<th>Flood Design Class 3</th>
<th>Flood Design Class 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal High Hazard Areas (Zone V) and Coastal A Zone</td>
<td>DFE</td>
<td>BFE +1 ft or DFE, whichever is higher</td>
<td>BFE +2 ft or DFE, or 500-year flood elevation, whichever is higher</td>
<td></td>
</tr>
</tbody>
</table>

### Minimum Elevation Below Which Flood-Damage-Resistant Materials Shall Be Used (Table ASCE 24-14 5-1)

<table>
<thead>
<tr>
<th></th>
<th>Flood Design Class 1</th>
<th>Flood Design Class 2</th>
<th>Flood Design Class 3</th>
<th>Flood Design Class 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone A not identified as Coastal A Zone</td>
<td>DFE</td>
<td>BFE +1 ft or DFE, whichever is higher</td>
<td>BFE +2 ft or DFE, or 500-year flood elevation, whichever is higher</td>
<td></td>
</tr>
<tr>
<td>Coastal High Hazard Areas (Zone V) and Coastal A Zone</td>
<td>DFE</td>
<td>BFE +1 ft or DFE, whichever is higher</td>
<td>BFE +2 ft or DFE, or 500-year flood elevation, whichever is higher</td>
<td></td>
</tr>
</tbody>
</table>

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A summary of significant technical revisions from ASCE 24-05 to ASCE 24-14 is reproduced on page 6 of these Highlights.
FEMA Building Code Resources

  - Excerpts of flood provisions of IBC, IRC, IEBC, IMC, IPC, IFGC, IFC, ISPSC, IPSDC, ICC-PC
  - Highlights of ASCE 24-14, *Flood Resistant Design and Construction*
  - Highlights of ASCE 24-05, *Flood Resistant Design and Construction*


- *Quick Reference Guide: Comparison of Select NFIP & Building Code Requirements in the SFHA (for 2012 and 2018 I-Codes)*

[http://www.fema.gov/building-code-resources](http://www.fema.gov/building-code-resources)

Dropdown lists are organized by hazard
Disaster Recovery Reform Act (DRRA)
Goal 1: Reducing Disaster Risk

- **DRRA Section 1234 – National Public Infrastructure Predisaster Hazard Mitigation**
  - Amends Stafford Act Sec. 203 to create a new pre-disaster mitigation program
  - Funded through 6% of aggregate amounts of Sec. 403, 406, 407, 408, 410, 416, and 428 grants
  - Authorizes redistribution of unobligated amounts; limited to States (and Indian Tribal Governments within States) that have received a declaration within 7 years
  - Also known as, Building Resilient Infrastructure & Communities... BRIC
  - Assistance to State/local gov may be used to establish & carry out code enforcement activities & implement latest published codes/standards
  - In determining tech & financial assistance, President shall take into account extent SLTT facilitated adoption & enforcement of latest published codes/standards (w/ amendments)
  - The term “latest published editions” defined as the 2 most recently published editions. Definition expires on Oct. 5, 2021

- **This provision creates a stable and much larger funding source for pre-disaster mitigation**
  - Not subject to an annual appropriation from Congress
  - Funding amount tied to amount of spending on disaster grants
Goal 1: Reducing Disaster Risk

- **DRRA Section 1206 – Code Administration and Enforcement**
  - Amends Stafford Act Sec. 402 to authorize assistance to State and local governments for building code and floodplain management ordinance administration and enforcement
  - Amends Stafford Act Sec. 406 to make eligible base and overtime wages for extra hires for enforcement of adopted building codes for 180 days

- **DRRA Section 1234 – BRIC**
  - Allows for code adoption as an eligible activity
  - Having effective building codes is one of the competitive factors for BRIC projects

- **DRRA Section 1235(b) – Consensus-Based Codes and Standards**
  - Authorizes FEMA to provide Public Assistance funding to replace and restore disaster damaged facilities to the latest published editions of relevant consensus-based codes and standards to ensure that facilities are restored in a matter that allows them to be “resilient.”

- **DRRA Section 1241: Post-Disaster Building Safety Assessment**
  - Directs FEMA to develop guidance for building experts to use when they assess structures for safety after a disaster.
Goal 1: Reducing Disaster Risk

- **DRRA Section 1204 & 1205 – Expands Eligible Wildfire Activities and Funding**
  - Authorizes FEMA to provide hazard mitigation grant funding under Sec. 404 in areas that receive FMAGs as a result of wildfire
    - Five funding letters already issued: Region 6 (New Mexico), Region 9 (California), Region 10 (Alaska)
  - Authorizes FEMA to provide assistance under its Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) program for activities related to wildfire and windstorm disaster mitigation.

- **DRRA Section 1233 – Building Capability Earthquake Early Warning**
  - Authorizes FEMA to provide assistance under HMGP and PDM programs for activities that reduce earthquake risk and support building capability for earthquake early warning in areas affected by earthquake hazards.

- **DRRA Section 1235(a) – Hazard Mitigation Grant Program for Resilience**
  - Section 404(a) now reads: ... **hazard mitigation measures** which the President has determined are cost effective and which substantially reduce the risk of, or **increase resilience to**, future damage, hardship, loss, or suffering in any area affected by a major disaster.
Other select On-Going Building Science Efforts
Other Select On-Going Efforts

- Support in development of FEMA Multi-Family Housing Public Guidance
- Guidelines for Wind Vulnerabilities Assessments for Critical Facilities
- Building Codes Work Group
- Advanced Bldg Science Concepts Course (ABSCC) (EMI launch Spring 2020)
Updating the Technical Bulletins

• Ongoing effort to update all TBs
• Updated TBs 0, 4, and 8 now available
• TBs 1, 5 and 10 to follow
• Update of others underway with update of TBs 2, 7 and 11 TBD
• Coordinating with Floodplain Management, Risk Insurance, with input from numerous stakeholders
• Schedule subject to change
Updating the Technical Bulletins

• To improve the **usability, credibility, and content** of the NFIP Technical Bulletins, the updates will include:
  
• Incorporation of and reference to the latest Codes, Standards, and Policies

• Updated guidance and best practices from post-disaster assessments

• Addressing issues identified by users and other stakeholders

• New introductory text and updated color images and graphics produced in a modern searchable PDF format
# Current NFIP Technical Bulletins

<table>
<thead>
<tr>
<th>TB No.</th>
<th>Title (Date)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Openings in Foundation Walls and Walls of Enclosures (2008)</td>
</tr>
<tr>
<td>2</td>
<td>Flood Damage-Resistant Materials Requirements (2008)</td>
</tr>
<tr>
<td>3</td>
<td>Non-Residential Floodproofing – Requirements and Certification (1993)</td>
</tr>
<tr>
<td>4</td>
<td>Elevator Installation for Buildings (2019)</td>
</tr>
<tr>
<td>5</td>
<td>Free-of-Obstruction Requirements (2008)</td>
</tr>
<tr>
<td>6</td>
<td>Below-Grade Parking Requirements (1993)</td>
</tr>
<tr>
<td>7</td>
<td>Wet Floodproofing Requirements (2003)</td>
</tr>
<tr>
<td>8</td>
<td>Corrosion Protection for Metal Connectors in Coastal Areas (2019)</td>
</tr>
<tr>
<td>10</td>
<td>Ensuring That Structures Built on Fill In or Near Special Flood Hazard Areas Are Reasonably Safe From Flooding (2001)</td>
</tr>
<tr>
<td>11</td>
<td>Crawlspace Construction for Buildings Located in Special Flood Hazard Areas (2001)</td>
</tr>
</tbody>
</table>

[Web search: “FEMA Technical Bulletins”]
National Building Code Losses Avoided Study

- Relative impact to States for adopting model building code
  - What might it save us nationally?
  - FEMA previously completed Regional pilot – now combining and analyzing ALL the states

- Risk
  - Actual building stock
  - Hazard
  - Impact or Consequence
  - Building code adoption and enforcement

- Estimate annual losses avoided

Phase 3 National Methodology and Phase 2 Regional Study
Losses Avoided as a Result of Adopting and Enforcing Hazard-Resistant Building Codes

September 2014

Federal Emergency Management Agency
Department of Homeland Security
500 C Street, SW
Washington, DC 20472
Briefing Overview

Other Select Building
Science Resources
FEMA P-1019 Emergency Power

- Natural Hazard Effects on Utilities and Building Systems
- Design Considerations for Optional Standby Power Systems in Existing Facilities
- Disaster Management and Operations Continuity
- Identifying Emergency Power Needs in Critical Facilities
- Emergency Power Sources and Systems
- Design Considerations for Emergency Power Systems in New Facilities
- Appendices A - E
Understanding and Improving Performance of Older Manufactured Homes During High-Wind Events

Primary audience:
- owners of “older” (pre-1994) manufactured homes. Building officials, manufactured home installers and contractors, and operators of manufactured home communities

Provides:
- Manufactured Home Ages
- How Older Manufactured Homes are Vulnerable to High-Wind Events
- Recommendations
Understanding and Improving Performance of New Manufactured Homes During High-Wind Events

Primary audience:
- owners of new manufactured homes. Prospective purchasers of manufactured homes, building officials, manufactured home installers, contractors, and operators of manufactured home communities may also find it informative.

Provides:
- Manufactured Home Ages
- How New Manufactured Homes are Vulnerable to Tornadoes and hurricanes
- Recommendations

Purpose and Intended Audience
The purpose of this Tornado Recovery Advisory is to provide guidance on reducing damage to new manufactured homes from high-wind events including tornadoes and hurricanes. For this recovery advisory, any manufactured home constructed after July 13, 1994 is considered a new manufactured home. Guidance for improving manufactured homes constructed before July 13, 1994, is contained in the Tornado Recovery Advisory titled Understanding and Improving Performance of Older Manufactured Homes During High-Wind Events.

This recovery advisory has been prepared for owners of new manufactured homes. Prospective purchasers of manufactured homes, building officials, manufactured home installers, contractors, and operators of manufactured home communities may also find it informative.

This Recovery Advisory Addresses:
- Manufactured home ages
- Vulnerabilities of new manufactured homes to tornadoes and hurricanes
- Recommendations

Manufactured Home Ages
Although there are no strict definitions of “older” and “new” manufactured homes, the following descriptions, which are based on the evolution of manufactured home construction standards, are useful.

“Older” Manufactured Homes: This category includes “pre-code” homes and “early code” homes. Some manufactured homes considered “older” may be relatively new from an expected service life standpoint, but are still old from a wind resistance standpoint. For this recovery advisory, any manufactured home constructed before July 13, 1994 is considered an older manufactured home.

Pre-Code Manufactured Homes: This refers to homes built before June 15, 1976, when the Department of Housing and Urban Development (HUD) began regulating construction. Prior to 1976, manufactured housing was essentially unregulated and wide variations in construction quality and strength existed. Pre-code manufactured homes were often called trailers or mobile homes because they were intended to be moved from place to place.

Early Code Manufactured Homes: These are homes built after June 15, 1976 (and before July 13, 1994) when the Manufactured Home Construction and Safety Standards (MHCSS), developed by HUD, first
Fact Sheet: Community Tornado Safe Room Doors: Installation and Maintenance

- November 2018
- Provides important information on Safe Room Doors
  - Safe Rooms vs Storm Shelters
  - Not all doors are the same
  - Installation
  - Maintenance
  - What about residential safe room doors?
  - What should be checked
  - How often should they be checked?
  - Solutions
  - Resources

Safe room door assemblies are one of the most important components of a safe room because they must provide the same level of protection as the walls and roof, yet also remain functional for quick access. To provide reliable life-safety protection against extreme wind events, safe room and storm shelter door assemblies should be certified as compliant with the latest edition of ICC 500, installed as specified by the manufacturer, and regularly maintained by the safe room owner or operator.

Safe Room versus Storm Shelter

Though similar, there are important differences between safe rooms and storm shelters. While both must meet all ICC 500 requirements, safe rooms also meet the Recommended Criteria for safe rooms described in FEMA P-381, Safe Rooms for Tornadoes and Hurricanes: Guidance for Community and Residential Safe Rooms (CORES); these criteria are more conservative than those presented in ICC 500 for storm shelters.

The differences are explained at the beginning of each chapter of FEMA P-381 Part B and summarized in Table D-1 of Appendix D. If a safe room will be constructed with FEMA grant funds, the Recommended Criteria become requirements, in addition to the requirements for storm shelters in ICC 500. Although not required, a best practice is to apply FEMA safe room guidance to storm shelters.

Since FEMA P-381 (2015) does not include Recommended Criteria specific to safe room opening protection, the ICC 500 requirements addressed in this fact sheet fully govern both storm shelters and safe rooms. Therefore, safe rooms are included by reference whenever this fact sheet uses the term “storm shelter.”
RiskMAP

- FEMA Building Science RiskMAP Fact Sheets; Dec 2018

- FS 1: FEMA Building Science Considerations for Risk MAP

- FS 2: FEMA Building Science Resources to Help Reduce Risk and Improve Resilience in Region IV

- Web search “FEMA RiskMAP Fact Sheets”
Available Resources

FEMA P-787 Catalog of FEMA Building Science Branch Publications and Training Courses *Fifth Edition / Sep 16*

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