Catalog of FEMA Flood and Wind Publications, Training Courses, and Workshops

FEMA P-787 / Second Edition / December 2009

FEMA Mitigation Directorate

Contents

These publications, courses, and workshops have been developed by the Building Science Branch of FEMA's Mitigation Directorate.

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FEMA BUILDING SCIENCE WEB PAGE

The Building Science Branch of the Risk Reduction Division at FEMA's Mitigation Directorate is a technical services bureau made up of highly skilled subject matter experts. The branch develops and produces technical guidance and tools focused on fostering a disaster-resilient built environment. The Building Science Branch supports the directorate's mission to reduce risk to life and property by providing state of the art technical hazard mitigation solutions for buildings.

For information about Building Science publications, call the flood/wind helpline at (866) 927-2104 (toll free) or email: FEMA-Buildingsciencehelp@dhs.gov for all other questions. For more information about any of the FEMA saferoom publications, please call the FEMA saferoom helpline at (866) 222-3580 (toll free), or email: Saferoom@dhs.gov.

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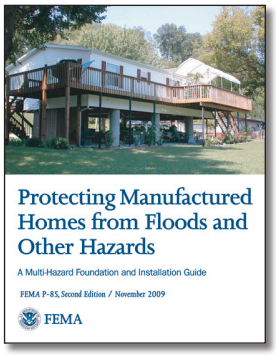
BUILDING SCIENCE PUBLICATIONS

DESIGN AND CONSTRUCTION GUIDANCE PUBLICATIONS

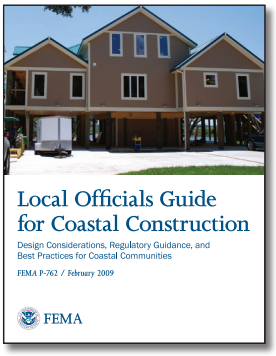
Protecting Manufactured Homes from Floods and Other Hazards (FEMA P-85 – Second Edition, November 2009)



This publication was designed to provide guidance for prospective homeowners, contractors, and local officials for the installation of manufactured homes in Special Flood Hazard Areas (SFHAs). Manufactured homes have unique challenges related to water intrusion into the structure. This publication addresses recommendations for foundation construction for this popular style of home.

http://www.fema.gov/library/viewRecord.do?id=1577

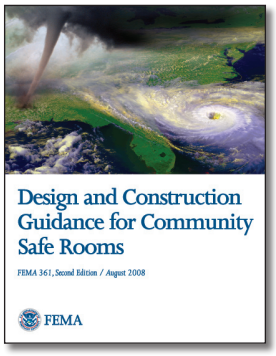
Local Officials Guide for Coastal Construction (FEMA P-762 – February 2009)



This guide was developed to assist building officials in understanding the connection between National Flood Insurance Program (NFIP) guidelines and applicable building codes and standards. It also explores evidence collected following recent storm events and recommends "best practices" where appropriate. The focus of this guide is on residential buildings, including detached single-family structures (three or fewer stories).

http://www.fema.gov/library/viewRecord.do?id=3647

Design and Construction Guidance for Community Safe Rooms (FEMA 361 – Second Edition, August 2008)

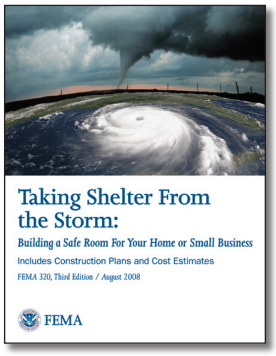


This document presents important information about the design and construction of community safe rooms that will provide protection during tornado and hurricane events.

Community safe rooms are designed and constructed to protect a large number of people from a natural hazard event. The number of persons taking refuge in the safe rooms will typically be more than 12 and could be up to several hundred or more.

http://www.fema.gov/library/viewRecord.do?id=1657

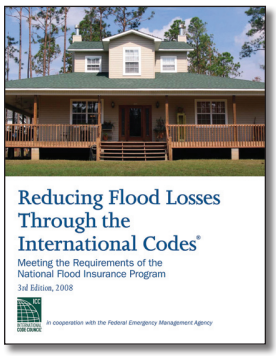
Taking Shelter From The Storm: Building a Safe Room For Your Home or Small Business (FEMA 320 – Third Edition, August 2008)



This document helps home and business owners decide how best to protect their families and employees from tornadoes and hurricanes. Designs for in-home, free-standing, and underground safe rooms to protect families and employees from the forces of wind and flying debris are provided. Construction plans and specifications in AutoCad and Microstation formats are also provided.

http://www.fema.gov/library/viewRecord.do?id=1536

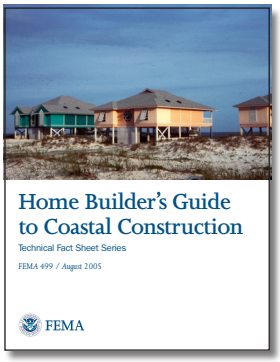
Reducing Flood Losses through the International Code Series (Third Edition, December 2007)



The 3rd edition of this guide is intended to help community officials decide how to integrate the 2006 edition (and 2007 Supplement) of the International Codes (I-Codes) into their current floodplain development and regulatory processes in order to meet the requirements to participate in the National Flood Insurance Program (NFIP). Careful attention is required to ensure that all requirements of the NFIP are addressed by communities through both building codes and other ordinances or regulations. Adoption of one or more of the I-Codes, by themselves, does not necessarily meet those requirements. This guide is not intended as an endorsement of any specific approach for achieving effective management of flood hazards, nor does it explain the NFIP requirements and how to administer them. The 2nd edition of this guide refers to the 2003 editions of the I-Codes. This publication is available in hardcopy for a modest fee (http://www.iccsafe.org).

http://www.fema.gov/library/viewRecord.do?id=2094

Home Builder's Guide to Coastal Construction Technical Fact Sheet Series (FEMA 499 – August 2005)



This document contains a series of 31 fact sheets that provide technical guidance and recommendations concerning the construction of coastal residential buildings. The fact sheets present information aimed at improving the performance of buildings subject to flood and wind forces in coastal environments. Photographs and drawings illustrate National Flood Insurance Program (NFIP) regulatory requirements, the proper siting of coastal buildings, and recommended design and construction practices for building components, including structural connections, the building envelope, and utilities. Many of the fact sheets also include lists of FEMA and other resources that provide more information about the topics discussed. Where appropriate, resources are accompanied by active web links.

http://www.fema.gov/rebuild/mat/mat_fema499.shtm

1. *Coastal Building Successes and Failures*

   This Technical Fact Sheet (No. 1) discusses how coastal construction requirements are different from those for inland construction, as well the characteristics that make for a successful coastal building.

2 *Coastal Construction Requirements and Recommendations*

   This Technical Fact Sheet (No. 2) summarizes National Flood Insurance Program (NFIP) regulatory requirements for new construction and for repairs, remodeling, and additions; and presents recommendations for exceeding those requirements in some instances.

3. *Using a Flood Insurance Rate Map (FIRM)*

   This Technical Fact Sheet (No. 3) explains the purpose of FIRMs; highlights features of a FIRM that are important to coastal builders, including flood hazard zones and flood elevations; and explains how to obtain FIRMs.

4. *Lowest Floor Elevation*

   This Technical Fact Sheet (No. 4) defines "lowest floor," discusses benefits of exceeding the NFIP minimum building elevation requirements, points out common construction practices that are violations of NFIP regulations, and discusses the NFIP Elevation Certificate. It also includes a copy of the certificate.

5. *V-Zone Design and Construction Certification*

   This Technical Fact Sheet (No. 5) explains the certification requirements for structural design and construction in V zones. It also includes a copy of a sample certificate and explains how to complete it.

6. *How Do Siting and Design Decisions Affect the Owner's Costs?*

   This Technical Fact Sheet (No. 6) discusses the effects of planning, siting, and design decisions on coastal home costs. Topics include initial, operating, and long-term costs; risk determination; and the effect on costs of meeting and exceeding code and NFIP design and construction requirements.

7. *Selecting a Lot and Siting the Building*

This Technical Fact Sheet (No. 7) presents guidance concerning lot selection and building siting considerations for coastal residential buildings. Topics include factors that constrain siting decisions, coastal setback lines, common siting problems, and suggestions for builders, designers, and owners.

8. *Coastal Building Materials*

This Technical Fact Sheet (No. 8) provides guidance on the selection of building materials used for coastal construction. Flood, wind, corrosion, and decay resistance are discussed, including protection recommendations.

9. *Moisture Barrier Systems*

This Technical Fact Sheet (No. 9) describes the moisture barrier system, explains how typical wall moisture barrier systems work, and discusses common problems associated with moisture barrier systems.

10. *Load Paths*

This Technical Fact Sheet (No. 10) illustrates the concept of load paths and highlights important connections in a typical wind uplift load path.

11. *Foundations in Coastal Areas*

This Technical Fact Sheet (No. 11) explains foundation design criteria and describes foundation types suitable for coastal environments. It also addresses foundations for high-elevation coastal areas (e.g., bluff areas).

12. *Pile Installation*

This Technical Fact Sheet (No. 12) presents basic information about pile design and installation, including pile types, sizes, and lengths; layout; installation methods; bracing; and capacities.

13. *Wood-Pile-to-Beam Connections*

This Technical Fact Sheet (No. 13) illustrates typical wood-pile-to-beam connections; presents basic construction guidance for various connection methods, including connections for misaligned piles; and illustrates pile bracing connection techniques.

14. Reinforced Masonry Pier Construction

This Technical Fact Sheet (No. 14) provides an alternative to piles in V and A zones in coastal areas where soil properties preclude pile installation, but the need for an "open foundation system" still exists. It also includes recommendations for good masonry practices in coastal environments.

15. *Foundation Walls*

This Technical Fact Sheet (No. 15) discusses and illustrates the use of foundation walls in coastal buildings. Topics include footing embedment, wall height, materials and workmanship, lateral support, flood openings and ventilation requirements, and interior grade elevations for crawlspaces.

16. *Masonry Details*

This Technical Fact Sheet (No. 16) illustrates important roof-to-wall and wall-to-foundation connection details for masonry construction in coastal areas. Topics include load paths, building materials, and reinforcement.

17. *Use of Connectors and Brackets*

This Technical Fact Sheet (No. 17) illustrates important building connections and the proper use of connection hardware throughout a building.

18. *Roof Sheathing Installation*

This Technical Fact Sheet (No. 18) presents information about proper roof sheathing installation and its importance in coastal construction; it also discusses fastening methods that will enhance the durability of a building in a high-wind area. Topics include sheathing types and layout methods for gable-end and hip roofs, fastener selection and spacing, the treatment of ridge vents and ladder framing, and common sheathing attachment mistakes.

19. *Roof Underlayment for Asphalt Shingle Roofs*

This Technical Fact Sheet (No. 19) presents recommended practices for the use of roofing underlayment as an enhanced secondary water barrier in coastal environments. Optional installation methods are also illustrated.

20. *Asphalt Shingle Roofing for High-Wind Regions*

This Technical Fact Sheet (No. 20) recommends practices for installing asphalt roof shingles that will enhance the wind resistance of roof coverings in high-wind, coastal regions. Issues include installation at hips, eaves, and ridges; shingle characteristics; weathering and durability; and wind resistance.

21. *Tile Roofing for High-Wind Areas*

This Technical Fact Sheet (No. 21) presents design and construction guidance for tile roofing attachment methods. Topics include uplift loads, uplift resistance, special considerations concerning tile attachment at hips and ridges, tile installation on critical and essential buildings, and quality control.

22. *Window and Door Installation*

This Technical Fact Sheet (No. 22) presents flashing detail concepts for window and door openings that provide adequate resistance to water intrusion in coastal environments, do not depend solely on sealants, are integral with secondary weather barriers (e.g., housewrap), and are adequately attached to the wall.

23. *Housewrap*

This Technical Fact Sheet (No. 23) explains the function of housewrap, examines its attributes, and addresses common problems associated with its use. Topics include housewrap vs. building paper and housewrap installation.

24. *Roof-to-Wall and Deck-to-Wall Flashing*

This Technical Fact Sheet (No. 24) emphasizes the importance of proper roof and deck flashing, and presents typical and enhanced flashing techniques for coastal homes.

25. *Siding Insulation and Connectors*

This Technical Fact Sheet (No. 25) provides basic installation tips for various types of siding, including vinyl, wood, and fiber cement.

26. *Shutter Alternatives*

This Technical Fact Sheet (No. 26) presents general information about the installation and use of storm shutters in coastal environments. Shutter types addressed include temporary plywood panels; temporary manufactured panels; permanent, manual closing; and permanent, motor-driven.

27. *Enclosures and Breakaway Walls*

This Technical Fact Sheet (No. 27) defines enclosures and breakaway walls, and discusses requirements and recommendations for their use below the base flood elevation (BFE).

28. *Decks, Pools, and Accessory Structures*

This Technical Fact Sheet (No. 28) summarizes NFIP requirements, general guidelines, and recommendations concerning the construction and installation of decks, access stairs and elevators, swimming pools, and accessory buildings under or near coastal residential buildings.

29. *Protecting Utilities*

This Technical Fact Sheet (No. 29) identifies the special considerations that must be made when installing utility equipment, such as fuel, sewage, and water/sewage lines in a coastal home, and presents recommendations for utility protection.

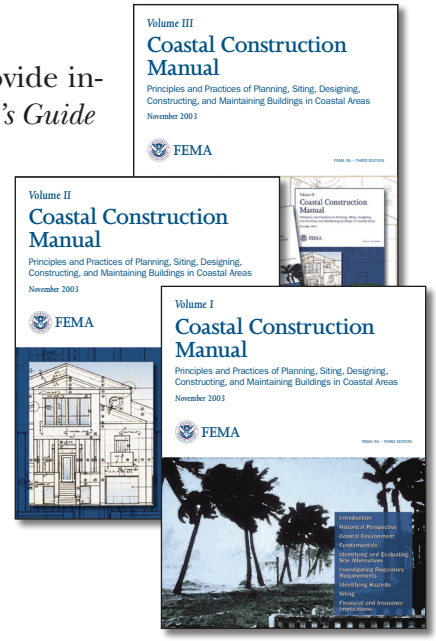
30. *Repairs, Remodeling, Additions, and Retrofitting*

This Technical Fact Sheet (No. 30) outlines NFIP requirements for repairs, remodeling, and additions, and discusses opportunities for retrofitting in coastal flood hazard areas. Recommendations for exceeding the minimum NFIP requirements are presented and definitions of "substantial damage" and "substantial improvement" are included.

31. *References*

This Technical Fact Sheet (No. 31) lists references that provide information relevant to the topics covered by the *Home Builder's Guide to Coastal Construction* technical fact sheets.

Coastal Construction Manual: Principles and Practices of Planning, Siting, Designing, Constructing, and Maintaining Residential Buildings in Coastal Areas (FEMA 55 – November 2003)



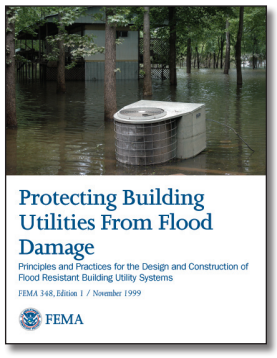
FEMA released the *Coastal Construction Manual*, an updated and expanded version of the manual first issued in 1985. The new *Coastal Construction Manual* is intended to help design professionals, state and local officials, and builders mitigate natural hazards to one- to four-family residential buildings in coastal areas.

Building on the numerous findings from BPAT and MAT investigations conducted in various coastal areas of the United States, the manual presents state-of-the-art engineering techniques for siting, design, construction, and maintenance aimed at reducing damage from natural hazard events, including hurricanes, nor'easters, and other coastal storms. Particular emphasis is placed on mitigating the simultaneous effects of high-velocity flow, wave action, debris impact, high winds, storm-induced and long-term erosion, and storm-induced scour. The manual also addresses multihazard issues such as the use of open foundations for buildings in seismically active coastal areas and the selection of building materials resistant to damage by water, windborne debris, and fire.

The manual consists of three volumes, with 14 chapters and 12 appendixes.

http://www.fema.gov/library/viewRecord.do?id=1671

Protecting Building Utilities From Flood Damage: Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems **(FEMA 348 – November 1999)**

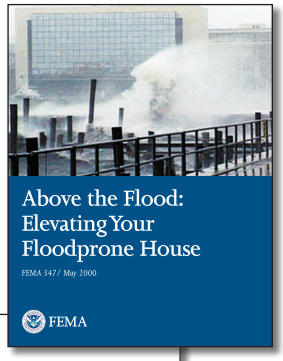


The overall objective of this document is to assist in the construction of buildings with utility systems that are designed and built so that the buildings can be reoccupied and fully operational as soon as electricity, sewer, and water are restored to the neighborhood.

http://www.fema.gov/library/viewRecord.do?id=1750

HURRICANE PUBLICATIONS

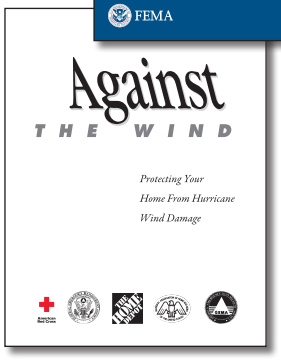
Above the Flood: Elevating Your Floodprone House **(FEMA 347 – May 2000)**



This publication shows how floodprone houses in south Florida were elevated above the 100-year flood level following Hurricane Andrew and also presents alternative elevation techniques.

http://www.fema.gov/library/viewRecord.do?id=1424

Against the Wind: Protecting Your Home from Hurricane and Wind Damage **(FEMA 247 – December 1993)**



This brochure discusses actions homeowners can take before the next hurricane strikes, including improvements or temporary wind protection. It is important that these projects be completed before a hurricane threatens.

http://www.fema.gov/library/viewRecord.do?id=1641

HURRICANE RECOVERY ADVISORIES

Designing for Flood Levels Above the BFE **(July 2006, revised in March 2009)**

This Hurricane Recovery Advisory recommends design and construction practices that reduce the likelihood of flood damage in the event that flood levels exceed the base food elevation (BFE).

http://www.fema.gov/library/viewRecord.do?id=3539

Enclosures and Breakaway Walls **(March 2009)**

This Hurricane Recovery Advisory discusses requirements and recommendations for enclosures and breakaway walls below the base flood elevation (BFE).

http://www.fema.gov/library/viewRecord.do?id=3539

Erosion, Scour, and Foundation Design **(March 2009)**

This Hurricane Recovery Advisory discusses how any lowering of the ground surface can affect the ability of a building foundation to resist design loads, and provides additional guidance for coastal foundation design.

http://www.fema.gov/library/viewRecord.do?id=3539

Metal Roof Systems in High-Wind Regions **(March 2009)**

This Hurricane Recovery Advisory recommends practices for designing and installing metal roof systems that will enhance wind resistance in high-wind regions. This Advisory is applicable to residential and commercial/industrial buildings and critical facilities.

http://www.fema.gov/library/viewRecord.do?id=3539

Minimizing Water Intrusion Through Roof Vents in High-Wind Regions **(March 2009)**

This Hurricane Recovery Advisory recommends practices for minimizing water intrusion through roof vent systems that can lead to interior damage and mold growth in high-wind regions.

http://www.fema.gov/library/viewRecord.do?id=3539

Siding Installation in High-Wind Regions **(March 2009)**

This Hurricane Recovery Advisory provides basic design and installation tips for various types of siding that will enhance wind resistance in high-wind regions (i.e., greater than 90-mph gust design wind speed).

http://www.fema.gov/library/viewRecord.do?id=3539

Design and Construction in Coastal A Zones **(December 2005, revised in January 2009)**

This Hurricane Recovery Advisory recommends design and construction practices in coastal areas where wave and flood conditions during the base flood will be less severe than in V zones, but still cause significant damage to typical light-frame construction.

http://www.fema.gov/library/viewRecord.do?id=3539

Attachment of Brick Veneer in High-Wind Regions (December 2005, revised in January 2009)

This Hurricane Recovery Advisory recommends practices for installing brick veneer that will enhance wind resistance in high-wind regions.

http://www.fema.gov/library/viewRecord.do?id=3539

Attachment of Rooftop Equipment in High-Wind Regions (May 2006, revised in July 2006)

This Hurricane Recovery Advisory recommends practices for designing and installing rooftop equipment that will enhance wind resistance in high-wind regions.

http://www.fema.gov/library/viewRecord.do?id=2633

Rooftop Attachment of Lightning Protection Systems in High-Wind Regions (May 2006, revised in July 2006)

This Hurricane Recovery Advisory recommends practices for installing lightning protection systems that will enhance wind resistance in high-wind regions.

http://www.fema.gov/library/viewRecord.do?id=2633

Reconstruction Guidance Using Hurricane Katrina Surge Inundation and Advisory Base Flood Elevations (November 2005)

This Hurricane Recovery Advisory discusses available flood hazard information and recommends reconstruction practices using Advisory Base Flood Elevations (AFBEs).

http://www.fema.gov/library/viewRecord.do?id=2633

Initial Restoration for Flooded Buildings (November 2005)

This Hurricane Recovery Advisory is specifically intended for buildings subject to the effects of long-term flooding and widespread mold growth following Hurricane Katrina.

http://www.fema.gov/library/viewRecord.do?id=2633

The ABC's of Returning to Flooded Buildings (November 2005)

Hurricane Katrina produced widespread flooding from both storm surge and levee breaches. This Hurricane Recovery Advisory assists impacted individuals when they are able to reach their flooded property.

http://www.fema.gov/library/viewRecord.do?id=2633

Roof Underlayment for Asphalt Shingle Roofs (November 2004)

This Hurricane Recovery Advisory recommends practices for the use of roofing underlayment as an enhanced secondary water barrier in coastal and inland hurricane-prone areas.

http://www.fema.gov/library/viewRecord.do?id=2632

Tile Roofing for Hurricane-Prone Areas (November 2004)

The purpose of this Hurricane Recovery Advisory is to recommend practices for designing and installing extruded concrete and clay tiles that will enhance wind resistance in high-wind coastal and inland hurricane-prone areas.

http://www.fema.gov/library/viewRecord.do?id=2632

Asphalt Shingle Roofing for High-Wind Regions (September 2004)

The purpose of this Hurricane Recovery Advisory is to recommend practices for installing asphalt roof shingles that will enhance wind resistance in high-wind coastal and inland hurricane-prone areas.

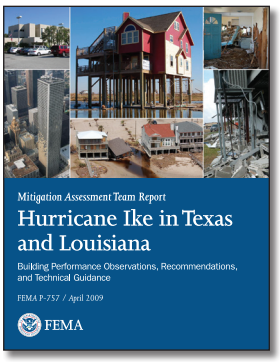
http://www.fema.gov/library/viewRecord.do?id=2632

MITIGATION ASSESSMENT TEAM REPORTS

In response to disasters, FEMA assembles a team of national experts from the design and construction industry, as well as from FEMA Headquarters and Regional Offices. This group is known as a Mitigation Assessment Team (MAT; formerly known as a Building Performance Assessment Team [BPAT]) and comprises structural, wind, and civil engineers; architects; coastal scientists; building code experts; and flood preservation specialists, as well as representatives from other government agencies, laboratories, associations, and universities. The MAT evaluates and assesses damage from hurricanes and other natural disasters, and provides observations, conclusions, and recommendations on the performance of buildings and other structures impacted by wind and flood forces. The conclusions and recommendations of the MAT reports provide decision-makers with information and technical guidance that can be used to reduce future damage from natural disasters.

Hurricanes

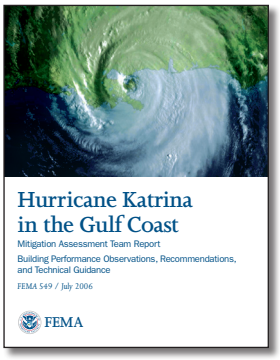
Mitigation Assessment Team Report – *Hurricane Ike in Texas and Louisiana* (FEMA P-757 – April 2009)



Hurricane Ike was the ninth named storm during the 2008 hurricane season and the seventh of the season's storms to hit the U.S. mainland. Hurricane Ike is likely to be one of the costliest and most destructive hurricanes in U.S. history; the total damage is estimated to be $21.3 billion dollars, making it the fourth costliest hurricane in history behind Hurricanes Katrina (2005), Andrew (1992), and Wilma (2005). The Mitigation Assessment Team (MAT) report focuses on damages to critical facilities and residential construction for both flood and wind. A special section focuses on damages to high-rise buildings in downtown Houston. Recommendations focus on actions that should be taken as part of the rebuilding efforts in Texas and Louisiana.

http://www.fema.gov/library/viewRecord.do?id=3577

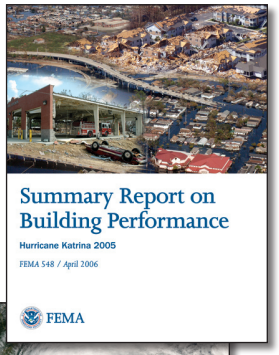
Mitigation Assessment Team Report – *Hurricane Katrina in the Gulf Coast: Building Performance Observations, Recommendations, and Technical Guidance* (FEMA 549 – July 2006)



Hurricane Katrina was one of the strongest and most destructive storms to hit the Gulf Coast of the United States in the last 100 years. Katrina significantly exceeded the base flood elevations (BFEs) by as much as 15 feet along parts of the Louisiana and Mississippi coasts. Flooding extended well beyond the inland flood limits of the Special Flood Hazard Area (SHFA), and the highest storm surge in U.S. history was recorded along the Mississippi coast. The American Red Cross estimated that Katrina destroyed over 300,000 single-family homes in Louisiana and Mississippi.

http://www.fema.gov/library/viewRecord.do?id=1857

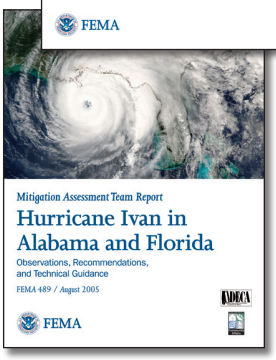
Mitigation Assessment Team Report – *Hurricane Katrina in the Gulf Coast: Summary Report* (FEMA 548 – April 2006)



This is an 80-page summary of the almost 700-page FEMA 549 MAT report.

http://www.fema.gov/library/viewRecord.do?id=1455

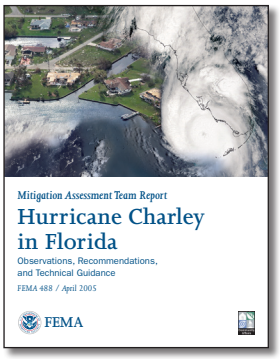
Mitigation Assessment Team Report – *Hurricane Ivan in Alabama and Florida: Building Performance Observations, Recommendations, and Technical Guidance* (FEMA 489 – August 2005)



Hurricane Ivan approximated a design flood event on the barrier islands and exceeded design flood conditions in sound and back bay areas. This provided a good opportunity to assess the adequacy of National Flood Insurance Program (NFIP) floodplain management requirements as well as current construction practices in resisting storm surge and wave damage. FEMA was particularly interested in evaluating damages to buildings in Coastal A zones where V-zone construction methods are not required.

http://www.fema.gov/library/viewRecord.do?id=1569

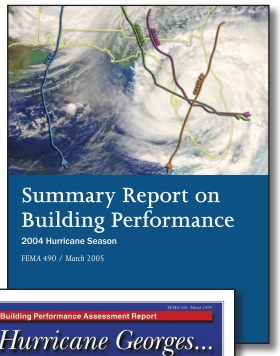
Mitigation Assessment Team Report – *Hurricane Charley in Florida: Building Performance Observations, Recommendations, and Technical Guidance* (FEMA 488 – April 2005)



Hurricane Charley was the strongest hurricane to hit Florida since Hurricane Andrew. The storm made an unexpected eastward turn prior to landfall and the storm surge was not as high as originally predicted by the National Hurricane Center. Charley did not cause extensive flood damage to the built environment and the MAT's investigations revealed that the storm was a design-level wind event. For these reasons, the report addresses primarily the effects of high winds and the means to help mitigate them.

http://www.fema.gov/library/viewRecord.do?id=1444

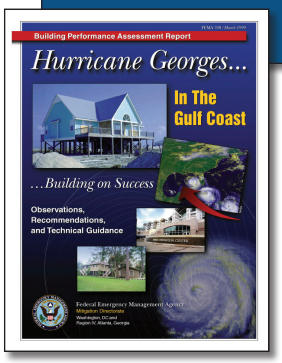
Summary Report on Building Performance 2004 Hurricane Season (FEMA 490 – March 2005)



This is a 68-page summary of the observation, conclusions, and recommendations from FEMA 488 and FEMA 489.

http://www.fema.gov/library/viewRecord.do?id=1445

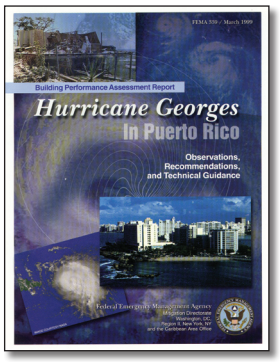
Building Performance Assessment Report – *Hurricane Georges in the Gulf Coast: Building Performance Observations, Recommendations, and Technical Guidance* (FEMA 338 – March 1999)



Hurricane Georges made landfall in the Ocean Springs/Biloxi, Mississippi, area. Over the next 30 hours, the storm moved slowly north and east, causing heavy damage along the Gulf Coast in Alabama, Florida, and Mississippi. Storm surges over the area ranged from more than 5 feet in Pensacola, Florida, to 9 feet in Pascagoula, Mississippi. According to the National Weather Service (NWS), the Town of Munson, Florida, in Santa Rosa County, received the highest recorded level of rainfall with more than 38 inches.

http://www.fema.gov/library/viewRecord.do?id=1537

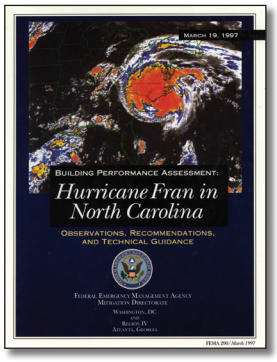
Building Performance Assessment Report – *Hurricane Georges in Puerto Rico: Building Performance Observations, Recommendations, and Technical Guidance* (FEMA 339 – March 1999)



This report presents observations on the success and failure of buildings in Puerto Rico in withstanding the wind and flood forces generated by Hurricane Georges. Several examples of successful mitigation implementation were noted, but a significant amount of damage was incurred due to lack of compliance with and enforcement of existing building codes.

http://www.fema.gov/library/viewRecord.do?id=1422

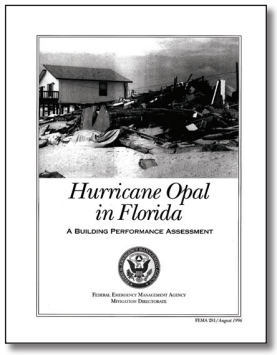
Building Performance Assessment Report – *Hurricane Fran in North Carolina: Building Performance Observations, Recommendations, and Technical Guidance* (FEMA 290 – March 1997)



Hurricane Fran made landfall near Cape Fear, North Carolina. Coastal areas experienced significant erosion and scour. Erosion caused by Hurricane Fran was exacerbated by the previous dune erosion caused by Hurricane Bertha, which made landfall in the same area only 2 months earlier. The erosion and scour added to the average erosion rate of 1 to 2 feet a year and left many oceanfront homes unable to withstand the loads experienced. The loss of supporting sand left many short pilings either completely exposed or embedded less than 2 feet.

http://www.fema.gov/library/viewRecord.do?id=2770

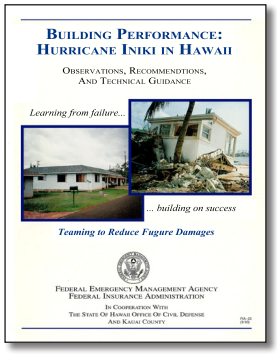
Building Performance Assessment Report – *Hurricane Opal in Florida* (FEMA 281 – August 1996)



Hurricane Opal was classified as a Category 3 storm on the Saffir-Simpson scale. Fifteen counties in the Florida Panhandle were declared Federal disaster areas. Most of the structural damage associated with the storm was to slab foundations; pile, post, column, and pier foundations; and framing systems. The damage was caused by coastal flood forces – storm surge, wind-generated waves, storm-induced erosion, and floodborne debris.

http://www.fema.gov/library/viewRecord.do?id=2769

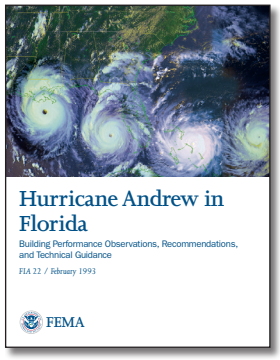
Building Performance Assessment Report – *Hurricane Iniki in Hawaii* (FIA 231 – March 1993)



Hurricane Iniki was the strongest and most destructive hurricane to strike the Hawaiian Islands in recent memory. The team investigated primary structural systems (i.e., systems in a building that resist lateral and vertical forces), and the effects of windborne and waterborne debris and the quality of construction and materials. The performance of exterior architectural systems (such as roofing, windows, and doors) was analyzed.

http://www.fema.gov/library/viewRecord.do?id=2767

Building Performance Assessment Report – *Hurricane Andrew in Florida* (FIA 22 – February 1993)



The team's investigation was similar to that conducted for Hurricane Iniki (i.e., the performance of primary structural systems and exterior architectural systems) and also included the effects of debris and the quality of construction workmanship. The loss of roof material and roof sheathing and the failure of windows and doors exposed interiors of buildings to further damage from wind and rain, resulting in significant damage to building interiors and contents that rendered many buildings uninhabitable.

http://www.fema.gov/library/viewRecord.do?id=2765

Tornadoes

Building Performance Assessment Report – *Midwest Tornadoes of May 3, 1999* (FEMA 342 – July 1999)

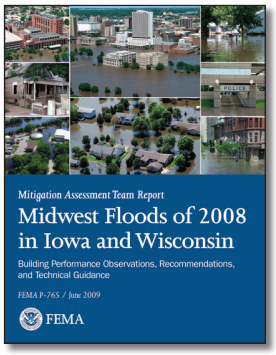
On the evening of May 3, 1999, tornadoes tore through parts of Oklahoma and Kansas, in areas that are considered part of "Tornado Alley," leveling entire neighborhoods and killing 49 people. The storms that spawned the tornadoes moved slowly, contributing to the development and redevelopment of individual tornadoes over an extended period of time. The MAT report presents observations, conclusions, and

recommendations intended to help communities, businesses, and individuals reduce future injuries and the loss of life and property resulting from tornadoes and other high-wind events.

http://www.fema.gov/library/viewRecord.do?id=1423

Floods

Mitigation Assessment Team Report – *Midwest Floods of 2008 in Iowa and Wisconsin* (FEMA P-765 – October 2009)

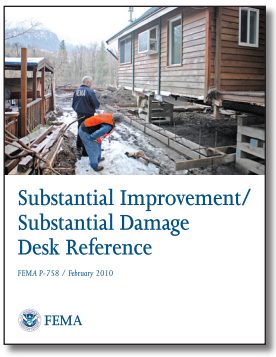


In August and September 2008, the Mitigation Assessment Team (MAT) deployed to the States of Iowa and Wisconsin to assess damage caused by riverine flooding from the 2008 Midwest floods. This report presents the MAT's observations on the success and failure of buildings impacted by these floods. Several examples of mitigation success stories were noted, as well lessons learned and recommendations resulting from field investigations. The report includes recovery advisories related to supporting homeowners making fundamental decisions relative to rebuilding as well as offering proactive methods to support the continuity of operations for critical facilities.

http://www.fema.gov/library/viewRecord.do?id=3851

MITIGATION PUBLICATIONS

Substantial Improvement/Substantial Damage Desk Reference (FEMA P-758 – scheduled to be published in 2010)



The Substantial Improvement/Substantial Damage (SI/SD) Desk Reference is designed as a comprehensive resource for local officials who are responsible for the administration of local codes and ordinances, including the SI/SD requirements. It also is intended for State officials who provide technical assistance to communities on the NFIP. Incorporating diagrams, decision charts, illustrations, and examples, the SI/SD Desk Reference is designed to clearly communicate responsibilities and strategies for administering this important NFIP requirement.

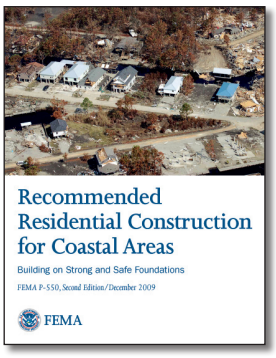
http://www.fema.gov/library

Substantial Damage Estimator (FEMA P-784 CD – January 2010)

The Substantial Damage Estimator (SDE) package contains the SDE software application, User's Manual, and Field Workbook. The software was developed to assist State and local officials in estimating building value and damage costs for residential and non-residential buildings. The software is based on the concept of using damage estimates for individual building elements to determine whether the structure as a whole is substantially damaged.

http://www.fema.gov/library

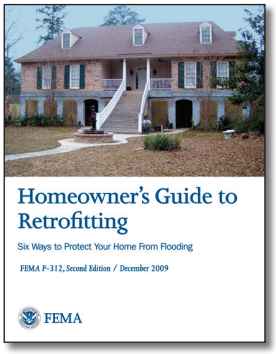
Recommended Residential Construction in Coastal Areas: Building on Strong and Safe Foundations (FEMA P-550 – Second Edition, December 2009)



Every storm has shown that, while good design and construction cannot completely eliminate risk, they can significantly reduce the risk to life and damage to property. This design manual provides recommended designs and guidance for rebuilding homes destroyed by hurricanes in coastal areas. The manual also provides guidance in designing and building less vulnerable new homes that reduce the risk to life and property.

http://www.fema.gov/library/viewRecord.do?id=1853

Homeowner's Guide to Retrofitting: Six Ways to Protect Your Home From Flooding (FEMA P-312, Second Edition – December 2009)



This handbook is intended for non-technical readers who are interested in additional information on flood protection methods. Illustrated discussions of house elevation, wet and dry floodproofing, relocation, levees and floodwalls, and demolition are supplemented with cost estimates, checklists, and decision-making worksheets.

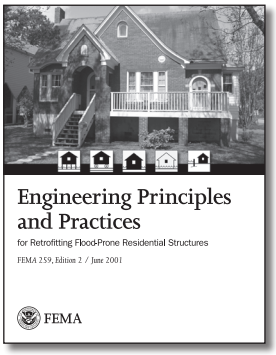
http://www.fema.gov/library/viewRecord.do?id=1420

Safe Room Resources CD (FEMA 388-CD – revised March 2009)

This CD contains displays, posters, handouts, multimedia, and other resources that provide information about mitigating for tornadoes or other high-wind events and the importance of safe rooms in saving lives during such events. Also included are: safe room display panels that contain artwork for reproducing the exhibit panels used in the National Emergency Training Center Safe Room Exhibit, maps on tornado activity in the U.S., posters, FEMA's *Taking Shelter From the Storm* brochure, various handouts, and a safe room PowerPoint presentation.

http://www.fema.gov/library/viewRecord.do?id=1801

Engineering Principles and Practices for Retrofitting Flood-Prone Residential Buildings (FEMA 259 – January 1995)



This manual is intended for architects, engineers, and building professionals who need technical guidance concerning flood retrofitting techniques that can be applied to existing buildings. Detailed specifications, computation examples, and cost data are presented.

http://www.fema.gov/library/viewRecord.do?id=1645

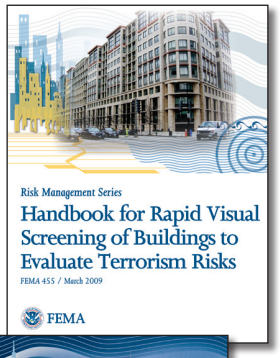
RISK MANAGEMENT SERIES

The Risk Management Series (RMS) is directed at providing design guidance for mitigating multihazard events. The objective of the series is to reduce physical damage to structural and nonstructural components of buildings and related infrastructure, and to reduce resultant casualties during natural and manmade disasters.

The RMS is intended to minimize conflicts that may arise from a multihazard design approach. A multihazard approach requires a complex series of tradeoffs. Security concerns need to be balanced with requirements in terms of earthquakes, floods, high-speed winds, accessibility, fire protection, and aesthetics, among others. Designing to mitigate natural hazards should avoid considering manmade hazards as an afterthought, but rather as a critical concern to be studied early during the project cycle. Natural hazards are the largest single contributor to catastrophic or repetitive damage to communities nationwide. Manmade hazards can be categorized as rare events with a potential high impact and very difficult to predict.

Natural Hazard RMS Publications

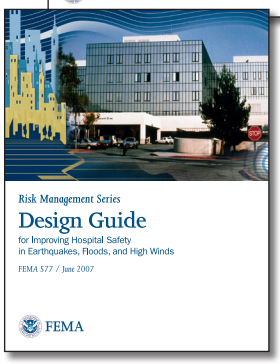
Handbook for Rapid Visual Screening of Buildings to Evaluate Terrorism Risks (FEMA 455 – March 2009)



This manual provides guidance for building inspectors, architects, and engineers on quickly and effectively determining what, if any, are the risks posed to the building by natural hazards, terrorist attacks, and other threats to the building's structural integrity.

http://www.fema.gov/library/viewRecord.do?id=1567

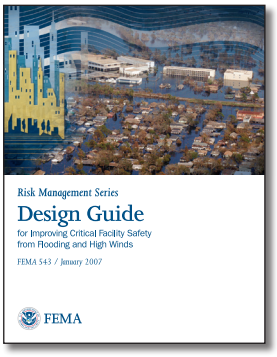
Design Guide for Improving Hospital Safety in Earthquakes, Floods, and High Winds (FEMA 577 – June 2007)



This publication provides design information for the construction of new hospitals and rehabilitation of existing ones with the purpose of improving their performance during the immediate aftermath of various hazard events. This manual is concerned with factors such as performance-based design and continuity of operations for this type of building. It provides a multihazard approach highlighting conflicts and benefits to consider when designing.

http://www.fema.gov/library/viewRecord.do?id=2739

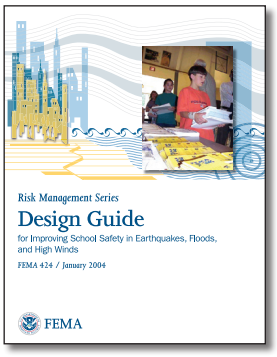
Design Guide for Improving Critical Facility Safety from Flooding and High Winds: Providing Protection to People and Buildings (FEMA 543 – January 2007)



This manual concentrates on critical facilities (hospitals, schools, fire and police stations, and emergency operations centers). It is based on the behavior of critical facilities during Hurricane Katrina and makes recommendations on the performance of these types of buildings. It includes extensive information on the impact of storm surges to the Gulf area.

http://www.fema.gov/library/viewRecord.do?id=2441

Design Guide for Improving School Safety in Earthquakes, Floods, and High Winds (FEMA 424 – January 2004)

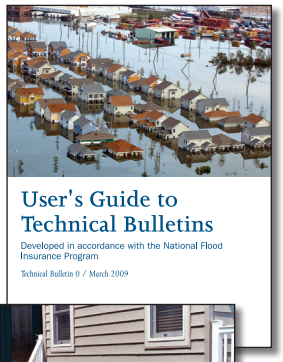


FEMA 424 is intended to provide design guidance for the protection of school buildings and their occupants against natural hazards, and concentrates on grade schools (K-12). The focus is on the design of new schools, but the repair, renovation, and extension of existing schools is also addressed. The manual introduces concepts on multihazard design and performance-based design and presents a general description and comparison of the hazards, including charts that show where design against each hazard interacts with design for other hazards.

http://www.fema.gov/library/viewRecord.do?id=1986

TECHNICAL BULLETINS

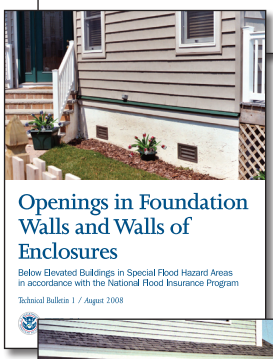
Technical Bulletin 0 – User's Guide to Technical Bulletins (TB-0 – March 2009)



This Technical Bulletin provides a list of available technical bulletins, a key word/subject reference index for all of the bulletins, and information about how to obtain copies of the bulletins.

http://www.fema.gov/library/viewRecord.do?id=1484

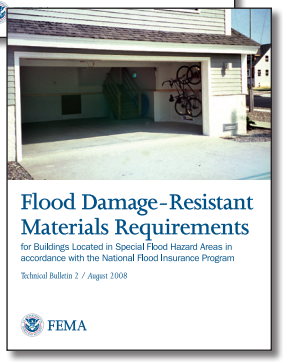
Technical Bulletin 1 – Openings in Foundation Walls and Walls of Enclosures (TB-1 – August 2008)



This Technical Bulletin provides guidance on the NFIP regulations concerning the requirements for openings in foundation walls for buildings with enclosures below the base flood elevation (BFE) and located in Special Flood Hazard Areas (SFHAs) shown on Flood Insurance Rate Maps (FIRMs) as Zones A, AE, A1-A30, AR, AO, and AH.

http://www.fema.gov/library/viewRecord.do?id=1579

Technical Bulletin 2 – Flood Damage-Resistant Materials Requirements (TB-2 – August 2008)



This Technical Bulletin provides guidance on the NFIP regulations concerning the required use of flood damage-resistant construction materials for building components located below the BFE in Special Flood Hazard Areas (SFHAs) in both A and V zones.

http://www.fema.gov/library/viewRecord.do?id=1580

3-93 Non-Residential Floodproofing – Requirements and Certification (FIA-TB-3 – April 1993)

This Technical Bulletin provides guidance on the NFIP regulations concerning watertight construction and the required certification for floodproofed non-residential buildings in Zones A, AE, A1-A30, AR, AO, and AH whose lowest floors are below the BFE.

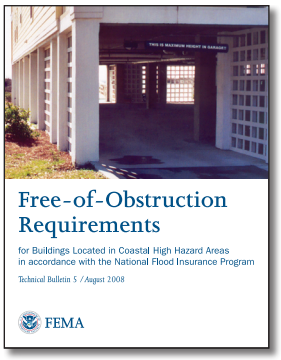
http://www.fema.gov/library/viewRecord.do?id=1716

4-93 Elevator Installation (FIA-TB-4 – April 1993)

This Technical Bulletin provides guidance on the NFIP regulations concerning the installation of elevators below the BFE in Special Flood Hazard Areas (both A and V zones).

http://www.fema.gov/library/viewRecord.do?id=1717

Technical Bulletin 5 – Free-of-Obstruction Requirements (TB-5 – August 2008)



This Technical Bulletin provides guidance on the NFIP regulations concerning obstructions to floodwaters below elevated buildings and on building sites in Coastal High Hazard Areas (Zones V, VE, and V1-V30).

http://www.fema.gov/library/viewRecord.do?id=1718

6-93 Below-Grade Parking Requirements (FIA-TB-6 – April 1993)

This Technical Bulletin provides guidance on the NFIP regulations concerning the design of below-grade parking garages beneath buildings located in Zones A, AE, A1-A30, AR, AO, and AH.

http://www.fema.gov/library/viewRecord.do?id=1719

7-93 Wet Floodproofing Requirements (FIA-TB-7 – December 1993)

This Technical Bulletin provides guidance on the NFIP regulations concerning wet floodproofing of certain types of structures located in Zones A, AE, A1-A30, AR, AO, and AH.

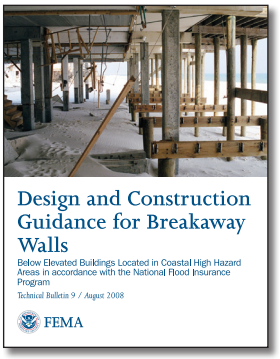
http://www.fema.gov/library/viewRecord.do?id=1720

8-96 Corrosion Protection for Metal Connectors in Coastal Areas (FIA-TB-8 – August 1996)

This Technical Bulletin provides guidance on the need for, selection of, and use of corrosion-resistant metal connectors for the construction of buildings in coastal areas.

http://www.fema.gov/library/viewRecord.do?id=1721

Technical Bulletin 9 – Design and Construction Guidance for Breakaway Walls (TB-9 – August 2008)



This Technical Bulletin provides prescriptive criteria for the design and construction of wood-frame and masonry breakaway walls beneath elevated buildings in Coastal High Hazard Areas compliant with NFIP regulatory requirements.

http://www.fema.gov/library/viewRecord.do?id=1722

10-01 Ensuring that Structures Built on Fill In or Near Special Flood Hazard Areas are Reasonably Safe From Flooding (FIA-TB-10 – May 2001)

This Technical Bulletin discusses building techniques, including the use of fill, that can be used to ensure structures are reasonably safe from flooding.

http://www.fema.gov/library/viewRecord.do?id=1723

11-01 Crawlspace Construction for Buildings Located in Special Flood Hazard Areas (FIA-TB-11 – November 2001)

This Technical Bulletin provides interim guidance on minimum NFIP requirements as well as best practices for crawlspace construction in Special Flood Hazard Areas.

http://www.fema.gov/library/viewRecord.do?id=1724

TORNADO RECOVERY ADVISORIES

Tornado Risks and Hazards in the Midwest United States (FEMA DR-1699-RA1 – August 2007)

The purpose of this Tornado Recovery Advisory is to summarize facts about the Midwest tornado hazard, specifically the area served by FEMA Region VII, which includes Iowa, Kansas, Missouri, and Nebraska. The general population, specifically homeowners and renters, policy makers, local officials, builders, and building officials know and understand that tornado occurrence in the Midwest is not a rare event. In fact, more than half of the 20 states with the highest frequency of tornado occurrence on record, and 4 of the top 5 (Texas, Oklahoma, Kansas, and Nebraska) are located in the Midwest. In addition, this RA identifies FEMA resources that can be used to help design and construct shelters that provide safe haven from tornadoes. These resources also guide construction of most building types (including residences) to minimize damage from extreme wind events.

http://www.fema.gov/library/viewRecord.do?id=2972

Storm Shelters: Selecting Design Criteria (FEMA DR-1699-RA2 – August 2007)

The intended audience for this Tornado Recovery Advisory is anyone involved in the planning, policy-making, design, construction, or approval of tornado 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 *Residential Sheltering: In-Residence and Stand-Alone Shelters*. The purpose of this advisory is to present information on different types of shelter design guidelines, code requirements, and other criteria that pertain to the design and construction of tornado shelters. There are various storm shelter criteria, each of which offer different levels of protection to its shelter occupants.

http://www.fema.gov/library/viewRecord.do?id=2973

Residential Sheltering: In-Residence and Stand-Alone Shelters (FEMA DR-1699-RA3 – August 2007)

The purpose of this Tornado Recovery Advisory is to alert homeowners, renters, and apartment building owners to the concept of in-residence and stand-alone storm shelters. The Advisory addresses considering the need for a shelter; in-residence shelter construction and retrofitting options; recommendations for sheltering when you cannot place a shelter within your home; best available refuge areas; and emergency supply kits and weather radios.

http://www.fema.gov/library/viewRecord.do?id=2974

Understanding and Improving Performance of Older Manufactured Homes During High-Wind Events (FEMA DR-1679-RA4 – April 2007)

The purpose of this Tornado Recovery Advisory is to provide guidance on reducing damage from high-wind events, including tornadoes and hurricanes, to manufactured homes constructed before July 13, 1994. The advisory also discusses ages of manufactured homes, vulnerabilities of older manufactured homes to high-wind events, and recommendations for reducing damage from high-wind events.

http://www.fema.gov/library/viewRecord.do?id=2631

Understanding and Improving Performance of New Manufactured Homes During High-Wind Events (FEMA DR-1679-RA5 – April 2007)

The purpose of this Tornado Recovery Advisory is to provide guidance on reducing damage from high-wind events, including tornadoes and hurricanes, to manufactured homes constructed after July 13, 1994. The advisory also discusses ages of manufactured homes, vulnerabilities of new manufactured homes to high-wind events, and recommendations for reducing damage from high-wind events.

http://www.fema.gov/library/viewRecord.do?id=2631

FLOOD RECOVERY ADVISORIES

Considerations for Rebuilding Your Flood-Damaged House (September 2009)

The purpose of this Flood Recovery Advisory is to provide information to assist with rebuilding decisions in the aftermath of the 2008 Midwest floods, as well as future flood events.

http://www.fema.gov/library/viewRecord.do?id=3824

Design Considerations for Improving Critical Facility Functionality During Flood Events (September 2009)

The purpose of this Flood Recovery Advisory is to provide recommendations for reducing the effects of flooding on existing critical facilities. It specifically applies to the essential critical facility systems that must remain functional during and after flood events.

http://www.fema.gov/library/viewRecord.do?id=3824

TRAINING COURSES AND WORKSHOPS

Numerous training courses have been developed and are offered at FEMA's Emergency Management Institute (EMI) in Emmitsburg, Maryland, as well as in the field.

Coastal Construction Workshop for Home Builders (FEMA 499)

FEMA developed a series of 31 technical fact sheets that provide guidance and recommendations concerning the construction of coastal residential buildings. The fact sheets present information aimed at improving the performance of buildings subject to flood and wind forces in coastal environments. This introductory-level 3-hour training is made available to construction

professionals in coastal areas to facilitate their understanding and use of these technical fact sheets and the design and construction practices they promote.

The goal of the workshop is to provide a practical learning experience that enables participants, upon completion of the workshop, to cite best practices that result in reduced damages to homes affected by coastal storms, locate information as needed in the *Home Builder's Guide to Coastal Construction* fact sheets, and implement building practices that will improve the performance of buildings subject to flood and wind forces in coastal environments.

If you are interested in this workshop, please contact your regional FEMA office (http://www.fema.gov/about/contact/regions.shtm) or Jacob Anderson, Program Specialist, Building Science Branch/Risk Reduction Division, FEMA HQ Mitigation Directorate, (202) 646-3423 or jack.anderson@dhs.gov.

Introduction to Coastal Foundation Design and Construction for Local Building Officials (FEMA 550)

FEMA has developed two courses on FEMA 550. One course is for local officials and a second, more detailed course, is for design professionals.

This 4-hour course instructs State and local government officials on the need to properly and effectively use FEMA 550, *Recommended Residential Construction for Coastal Areas*, to develop foundations for homes located in coastal areas. The course will provide building officials and community decision-makers better understanding on the need for prescriptive foundation design guidance. Contemporary codes and standards will be introduced, and their importance will be discussed. The course will cover (1) the effect of natural hazards on coastal foundations; (2) the introduction of building codes and standards; (3) regulatory requirements determining where and how buildings may be sited, designed, and constructed; and (4) the introduction and use of FEMA 550. The intent is for sound mitigation measures and building code requirements to be procedurally adopted and implemented, which will decrease the vulnerability of foundations to major wind and flood events.

If you are interested in this training course, please contact your regional FEMA office (http://www.fema.gov/about/contact/regions.shtm) or John Ingargiola, Senior Engineer, Building Science Branch/Risk Reduction Division, FEMA HQ Mitigation Directorate, (202) 646-3452 or john.ingargiola@dhs.gov.

Introduction to Coastal Foundation Design and Construction for Design Professionals (FEMA 550)

This 1-day course is the second of two courses on FEMA 550, *Recommended Residential Construction for Coastal Areas*, developed by FEMA and is geared to design professionals. The course focuses on the guidance contained in the manual. It discusses the unique loads foundations must resist in coastal and near coastal areas (flood, debris, breaking waves, etc.); addresses NFIP requirements; and discusses designing for high-wind events and for erosion and scour. The course describes the assumptions used in developing the FEMA 550 foundation designs and how the designs can be customized by professionals to develop foundations for specific homes. Copies of FEMA 550 and a Student Manual will be provided.

If you are interested in this training course, please contact your regional FEMA office (http://www.fema.gov/about/contact/regions.shtm) or John Ingargiola, Senior Engineer, Building

Science Branch/Risk Reduction Division, FEMA HQ Mitigation Directorate, (202) 646-3452 or john.ingargiola@dhs.gov.

The Flood Provisions of the International Code Series and ASCE 24

This 4-hour workshop presents basic information needed to understand the flood provisions of the International Code Series and ASCE 24, *Flood Resistant Design and Construction* and the importance of coordinating local floodplain management ordinances with building codes. The 2009, 2006, and 2003 editions of the International Codes (I-Codes) contain flood resistant provisions that FEMA has determined to be consistent with the NFIP. Reading materials will be distributed in advance. Participants will learn how the I-Code provisions are consistent with the NFIP regulations; understand the relationship between the I-Codes and ASCE 24: learn about distinctions between the I-Codes and ASCE 24, and the NFIP regulations; learn the importance of coordinating the I-Codes with local floodplain management ordinances; and review a sample "companion" ordinance designed specifically to coordinate with the I-Codes.

If you are interested in this workshop, please contact your regional FEMA office (http://www.fema.gov/about/contact/regions.shtm) or John Ingargiola, Senior Engineer, Building Science Branch/Risk Reduction Division, FEMA HQ Mitigation Directorate, (202) 646-3452 or john.ingargiola@dhs.gov.

Multi-Hazard Mitigation Design Considerations (EMI 312)

This 2½-day course is designed to introduce potential natural hazard impacts on the performance of the constructed environment. The target audience is Federal, State, and local emergency response staff; local building officials; and other building professionals responsible for the design and/or operation of buildings or other infrastructure facilities. Hazards discussed include floods, winds, earthquakes, and wildfires. The behavior of each hazard is reviewed, followed by a discussion of their potential impacts on or threats to buildings and infrastructure. The threats are evaluated qualitatively and quantitatively. The introduction to each hazard is followed by a discussion of mitigation strategies and techniques proven to be effective in mitigating the effects of that hazard. After discussions of the individual hazards are complete, the mitigation measures are represented for further evaluation relative to hazards other than the specific hazard for which it was originally intended. The focus is to not only identify mitigation strategies that may reduce the risks from more than one hazard, but also to consider the potential unintended increased risks from another hazard.

If you are interested in this training course, please contact your regional FEMA office (http://www.fema.gov/about/contact/regions.shtm) or Mai Tong, Physical Scientist, Building Science Branch/Risk Reduction Division, FEMA HQ Mitigation Directorate, (202) 646-4681 or mai.tong@dhs.gov.

Design and Construction of Safe Rooms for Architects and Engineers (FEMA 361)

Two versions of the training course on the August 2008 edition of FEMA 361 are available:

- The 2-day training course discusses design and construction of community safe rooms. The target audience is architects, engineers, and emergency managers. The training discusses revisions to background and hazard identification, revisions to design and construction guidance criteria (specific to tornado, hurricane, and combined hazards), and revisions

made to align the publication with the minimum requirements of the ICC/NSSA-500 *Standard for the Design and Construction of Storm Shelters*. Specific guidance and design criteria are provided where the ICC-500 Standard does not address operational or emergency management issues. The presentation will also cover the elements of the wind and flood design criteria in FEMA 361 that remain more restrictive than those developed for the ICC-500 Standard. The latter is important as FEMA 361 is the basis of the technical design criteria used for FEMA grant programs that fund the design and construction of hurricane and tornado safe rooms.

- The 1-day training course focuses on the evaluation of proposed areas or buildings for use as community safe rooms or areas of last resort if they do not meet the FEMA 361 criteria. The target audience is architects, engineers, and emergency managers. The course provides background on safe room design and construction issues and reviews the use of the Extreme-Wind Refuge Area Evaluation Checklists provided in Appendix B of the revised FEMA 361. After a brief review of tornado and hurricane wind hazards, the instructors will discuss FEMA 361 design criteria, and focus on and present checklists and tools for building evaluations. Students will have the opportunity to complete a case study by evaluating a potential safe room structure while using the FEMA 361 Appendix B checklists.

If you are interested in this training courses, please contact your regional FEMA office (http://www.fema.gov/about/contact/regions.shtm) or John Ingargiola, Senior Engineer, Building Science Branch/Risk Reduction Division, FEMA HQ Mitigation Directorate, (202) 646-3452 or john.ingargiola@dhs.gov.

Retrofitting Flood-Prone Residential Buildings (EMI 279)

FEMA developed a technical training course on proper methods of retrofitting residential buildings. The course is available as a 1-week course offered several times a year at EMI or as a 2-day field-deployed version. FEMA will provide all course materials free of charge and may be able to provide, under certain circumstances, expert trainers at no charge. For technical assistance in offering the field course, contact your NFIP State Coordinator, FEMA Regional Offices, or Disaster Field Office. To register, all applications must be submitted through your State Emergency Management Training Office.

If you are interested in this training course, please contact your regional FEMA office (http://www.fema.gov/about/contact/regions.shtm) or John Ingargiola, Senior Engineer, Building Science Branch/Risk Reduction Division, FEMA HQ Mitigation Directorate, (202) 646-3452 or john.ingargiola@dhs.gov.

Residential Coastal Construction (EMI 386)

FEMA designed this 4½-day course to train participants on FEMA's *Coastal Construction Manual* (FEMA 55), which is the primary, state-of-the-art reference for planning, designing, and constructing residential structures in various coastal environments. The target audience is engineers, architects, and building code officials. Floodplain management, hazard mitigation, planning, and building officials with building science knowledge may also apply. The course is taught at EMI. An Independent Study Course is also available.

If you are interested in this training course, please contact your regional FEMA office (http://www.fema.gov/about/contact/regions.shtm) or John Ingargiola, Senior Engineer, Building

Science Branch/Risk Reduction Division, FEMA HQ Mitigation Directorate, (202) 646-3452 or john.ingargiola@dhs.gov.

Design Guide for Improving Critical Facility Safety from Flooding and High Winds: Providing Protection to People and Buildings (FEMA 543)

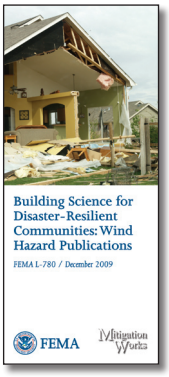
This 2-day course on FEMA 543 was developed to help improve the design, construction, reconstruction, and rehabilitation of critical facilities in areas exposed to flooding and high winds. The target audience is architects and engineers with existing knowledge of building science.

The performance of critical facilities (e.g., hospitals, fire and police stations, schools, and emergency operations centers) during recent natural disasters has been impaired by storm-related damages, as documented by post-disaster reports. Critical facilities provide critical life-safety services to citizens of affected areas. The course is intended to enable participants to support and implement design techniques and construction practices that will improve building performance and result in critical facilities remaining fully operational during and after flooding and high-wind events.

If you are interested in this training course, please contact your regional FEMA office (http://www.fema.gov/about/contact/regions.shtm) or Paul Tertell, Senior Engineer, Building Science Branch/Risk Reduction Division, FEMA HQ Mitigation Directorate, (202) 646-3935 or paul.tertell@dhs.gov.

BROCHURES

Building Science for Disaster-Resilient Communities – Wind Hazard Publications (FEMA L-780 – December 2009)



This brochure provides readers with a quick summary of publications that will help them prepare for and mitigate against wind hazards. It describes how severe wind storms often directly damage roofs, windows, and exterior finishes. The impact that wind has on the envelope of a building can also impact the superstructure of the building, and breaches in a building envelope frequently contribute to additional damages. Debris such as signs, roofing material, and other small items can also become flying missiles during wind events, which can pose a danger to your home or the safety of you and your family.

Proper design and construction provides resilient buildings that resist damages from hurricane-force winds and other high-wind events.

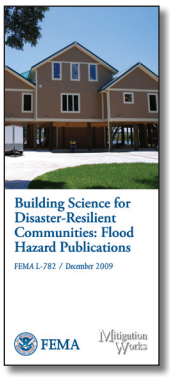
Building Science for Disaster-Resilient Communities – Hurricane Hazard Publications (FEMA L-781 – December 2009)

This brochure provides readers with a quick summary of publications that will help them prepare for and mitigate against hurricane wind hazards. During a hurricane, homes, businesses, public buildings, and infrastructure may be damaged or destroyed by many different storm hazards. Debris can break windows and doors, allowing high winds and rain inside the home. In extreme storms (such as Hurricanes Hugo, Andrew, and Katrina), the force of the wind alone can cause tremendous devastation, as trees and power lines topple and weak

elements of homes and buildings fail. Roads and bridges can be washed away and homes saturated by flooding.

Hurricanes pose a particular hazard to buildings, and proper design and construction are essential to help buildings withstand the impact of these storms.

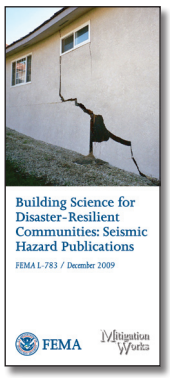
Building Science for Disaster-Resilient Communities – Flood Hazard Publications (FEMA L-782 – December 2009)



This brochure provides readers with a quick summary of publications that will help them prepare for and mitigate against flood hazards.

Buildings located in flood hazard areas are at risk from forces generated by floodwaters. These forces can include hydrostatic forces from slow moving floodwaters, hydrodynamic forces from waves and quickly moving water, as well as scour around building elements, erosion, and flood-borne debris.

Building Science for Disaster-Resilient Communities – Seismic Hazard Publications (FEMA L-783 – December 2009)

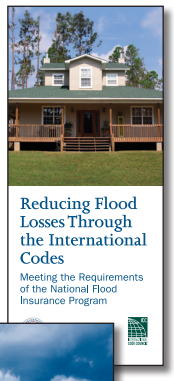


This brochure provides readers with a quick summary of publications that will help them prepare for and mitigate against seismic hazards.

As a member of the National Earthquake Hazards Reduction Program (NEHRP), FEMA seeks to mitigate earthquake losses in the United States through implementation activities in the fields of earthquake science and engineering.

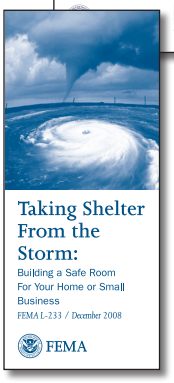
FEMA's Building Science Branch develops and produces effective practices and policies for earthquake loss-reduction, techniques to reduce the seismic vulnerability of facilities and systems, and works to improve seismic hazards identification and risk-assessment methods and their use.

Reducing Flood Losses Through the International Codes: Meeting the Requirements of the National Flood Insurance Program (December 2008)



The primary purpose of this brochure is to help communities decide how to coordinate the I-Codes with their floodplain management programs and land development procedures. It discusses the benefits of disaster-resistant codes, community responsibilities under the NFIP, and the benefits of adopting standards that exceed the minimum requirements.

Taking Shelter From the Storm: Building a Safe Room For Your Home or Small Business (FEMA L-233 – December 2008)



This brochure is about FEMA 320, Taking Shelter From the Storm, Building a Safe Room For Your Home or Small Business, which is now in its third edition. It briefly describes how having a safe room built for your home or small business can help provide "near-absolute protection" for you and your family or employees from injury or death caused by the dangerous forces of extreme winds such as tornadoes and hurricanes.

PROTECT YOUR PROPERTY OR BUSINESS FROM DISASTER SERIES

In this series of publications you can find information on how to protect yourself, your home, business, and property from various hazards. The publications are divided into three categories: natural hazards, flooding, and high winds.

http://www.fema.gov/plan/prevent/howto/index.shtm

Protect Your Business from All Natural Hazards

These two publications describe how protecting your business from disasters caused by natural hazards can involve a variety of actions, from inspecting and maintaining your buildings to installing protective devices. Most of these actions, especially those that affect the structure of your buildings or their utility systems, should be carried out by qualified maintenance staff or professional contractors licensed to work in your state, county, or city. One example of disaster protection is safely storing the important documents, electronic files, raw materials, and inventory required for the operation of your business.

1. *Protect Business Records and Inventory*
2. *Install a Generator for Emergency Power*

http://www.fema.gov/library/viewRecord.do?id=3259

Protect Your Property from Flooding

These eight publications offer information on how protecting your property from flooding can involve a variety of actions, from inspecting and maintaining the building to installing protective devices. Most of these actions, especially those that affect the structure of your building or its utility systems, should be carried out by qualified maintenance staff or professional contractors licensed to work in your state, county, or city.

1. *Build With Flood Damage Resistant Materials*
2. *Dry Floodproof Your Building*
3. *Add Waterproof Veneer to Exterior Walls*
4. *Raise Electrical System Components*
5. *Anchor Fuel Tanks*
6. *Raise or Floodproof HVAC Equipment*
7. *Install Sewer Backflow Valves*
8. *Protect Wells From Contamination by Flooding*

http://www.fema.gov/library/viewRecord.do?id=3262

Protect Your Property from High Winds

These nine publications offer information on how protecting your property from high winds can involve a variety of actions, from inspecting and maintaining your building to installing

protective devices. Most of these actions, especially those that affect the exterior shell of your building, should be carried out by qualified maintenance staff or professional contractors licensed to work in your state, county, or city. For buildings with Exterior Insulation Finishing System (EIFS) walls, a type of wall often used for commercial buildings, one example of wind protection is inspecting and maintaining the walls.

1. *Maintain EIFS Walls*
2. *Protect Windows and Doors with Covers*
3. *Reinforce Double Entry Doors*
4. *Reinforce or Replace Garage Doors*
5. *Remove Trees and Potential Windborne Missiles*
6. *Secure Metal Siding and Metal Roofs*
7. *Secure Built-Up and Single-Ply Roofs*
8. *Secure Composition Shingle Roofs*
9. *Brace Gable End Roof Framing*

http://www.fema.gov/library/viewRecord.do?id=3263

Table 1. FEMA Flood and Wind Publications, Training Courses, and Workshops

	Flood Damage	Wind Damage	Preparedness	Accessibility
Building Science Publications				
Protecting Manufactured Homes from Floods and Other Hazards (FEMA P-85 – Second Edition, November 2009)	✔		✔	💻 🗐 ⊙
Local Officials Guide for Coastal Construction (FEMA P-762 – February 2009)	✔	✔	✔	💻 🗐 ⊙
Design and Construction Guidance for Community Safe Rooms (FEMA 361 – Second Edition, August 2008)	✔	✔	✔	💻 🗐 ⊙
Taking Shelter From The Storm: Building a Safe Room For Your Home or Small Business (FEMA 320 – Third Edition, August 2008)		✔	✔	💻 🗐 ⊙
Reducing Flood Losses Through the International Codes (Third Edition, December 2007)	✔	✔	✔	💻 🗐 ⊙
Home Builder's Guide to Coastal Construction Technical Fact Sheet Series (FEMA 499 – August 2005)	✔	✔	✔	💻 🗐

Table 1. FEMA Flood and Wind Publications, Training Courses, and Workshops (continued)

	Flood Damage	Wind Damage	Preparedness	Accessibility
Coastal Construction Manual: Principles and Practices of Planning, Siting, Designing, Constructing, and Maintaining Residential Buildings in Coastal Areas (FEMA 55 – November 2003)	✔	✔	✔	🗐 ⊙
Protecting Building Utilities From Flood Damage (FEMA 348 – November 1999)	✔		✔	💻 🗐 ⊙
Hurricane Publications				
Above the Flood: Elevating Your Floodprone House (FEMA 347 – May 2000)	✔		✔	💻 🗐 ⊙
Against the Wind: Protecting Your Home from Hurricane and Wind Damage (FEMA 247 – December 1993)		✔	✔	💻 🗐
Hurricane Recovery Advisories				
Designing for Flood Levels Above the BFE (July 2006, revised in March 2009)	✔		✔	💻
Enclosures and Breakaway Walls (March 2009)	✔		✔	💻
Erosion, Scour, and Foundation Design (March 2009)	✔		✔	💻
Metal Roof Systems in High-Wind Regions (March 2009)		✔	✔	💻
Minimizing Water Intrusion Through Roof Vents in High-Wind Regions (March 2009)		✔	✔	💻
Siding Installation in High-Wind Regions (March 2009)		✔	✔	💻
Design and Construction in Coastal A Zones (December 2005, revised in January 2009)	✔		✔	💻
Attachment of Brick Veneer in High-Wind Regions (December 2005, revised in January 2009)		✔	✔	💻
Attachment of Rooftop Equipment in High-Wind Regions (May 2006, revised in July 2006)		✔	✔	💻
Rooftop Attachment of Lightning Protection Systems in High-Wind Regions (May 2006, revised in July 2006)		✔	✔	💻
Reconstruction Guidance Using Hurricane Katrina Surge Inundation and Advisory Base Flood Elevations (November 2005)	✔		✔	💻
Initial Restoration for Flooded Buildings (November 2005)	✔		✔	💻
The ABC's of Returning to Flooded Buildings (November 2005)	✔		✔	💻
Roof Underlayment for Asphalt Shingle Roofs (November 2004)	✔		✔	💻

💻 AVAILABLE ONLINE 🗐 AVAILABLE IN PRINT ⊙ AVAILABLE ON CD

Table 1. FEMA Flood and Wind Publications, Training Courses, and Workshops (continued)

	Flood Damage	Wind Damage	Preparedness	Accessibility
Tile Roofing for Hurricane-Prone Areas (November 2004)		✔	✔	💻
Asphalt Shingle Roofing for High-Wind Regions (September 2004)		✔	✔	💻
Mitigation Assessment Team Reports				
Hurricanes				
Mitigation Assessment Team Report – *Hurricane Ike in Texas and Louisiana: Building Performance Observations, Recommendations, and Technical Guidance* (FEMA P-757 – April 2009)	✔	✔	✔	💻 🗐 ⊙
Mitigation Assessment Team Report – *Hurricane Katrina in the Gulf Coast: Building Performance Observations, Recommendations, and Technical Guidance* (FEMA 549 – July 2006)	✔	✔	✔	💻 🗐 ⊙
Mitigation Assessment Team Report – *Hurricane Katrina in the Gulf Coast: Summary Report* (FEMA 548 – April 2006)	✔	✔	✔	💻 🗐 ⊙
Mitigation Assessment Team Report – *Hurricane Ivan in Alabama and Florida: Building Performance Observations, Recommendations, and Technical Guidance* (FEMA 489 – August 2005)	✔	✔	✔	💻 🗐 ⊙
Mitigation Assessment Team Report – *Hurricane Charley in Florida: Building Performance Observations, Recommendations, and Technical Guidance* (FEMA 488 – April 2005)		✔	✔	💻 🗐 ⊙
Summary Report on Building Performance 2004 Hurricane Season (FEMA 490 – March 2005)	✔	✔	✔	💻 🗐 ⊙
Building Performance Assessment Report – *Hurricane Georges in the Gulf Coast: Building Performance Observations, Recommendations, and Technical Guidance* (FEMA 338 – March 1999)	✔	✔	✔	💻 🗐
Building Performance Assessment Report – *Hurricane Georges in Puerto Rico: Building Performance Observations, Recommendations, and Technical Guidance* (FEMA 339 – March 1999)	✔	✔	✔	💻 🗐
Building Performance Assessment Report – *Hurricane Fran in North Carolina: Building Performance Observations, Recommendations, and Technical Guidance* (FEMA 290 – March 1997)	✔	✔	✔	💻 🗐

Table 1. FEMA Flood and Wind Publications, Training Courses, and Workshops (continued)

	Flood Damage	Wind Damage	Preparedness	Accessibility
Building Performance Assessment Report – *Hurricane Opal in Florida: Building Performance Observations, Recommendations, and Technical Guidance* (FEMA 281 – August 1996)	✔		✔	💻 🗐
Building Performance Assessment Report – *Hurricane Iniki in Hawaii: Building Performance Observations, Recommendations, and Technical Guidance* (FIA 23 – March 1993)	✔	✔	✔	💻 🗐
Building Performance Assessment Report – *Hurricane Andrew in Florida: Building Performance Observations, Recommendations, and Technical Guidance* (FIA 22 – February 1993)		✔	✔	💻 🗐
Tornadoes				
Building Performance Assessment Report – *Midwest Tornadoes of May 3, 1999: Building Performance Observations, Recommendations, and Technical Guidance* (FEMA 342 – July 1999)		✔		💻 🗐
Floods				
Mitigation Assessment Team Report – *Midwest Floods of 2008 in Iowa and Wisconsin* (FEMA P-765, 2009)	✔		✔	💻 🗐 ⊙
Mitigation Publications				
Substantial Improvement/Damage Damage Desk Reference (FEMA P-758 – scheduled to be published in 2010)	✔	✔		💻 🗐 ⊙
Substantial Damage Estimator (FEMA P-784 CD – January 2010	✔	✔		⊙
Recommended Residential Construction for Coastal Areas: Building on Strong and Safe Foundations (FEMA 550 – Second Edition, December 2009)	✔	✔	✔	💻 🗐 ⊙
Homeowner's Guide to Retrofitting: Six Ways to Protect Your Home From Flooding (FEMA P-312 – December 2009)	✔		✔	💻 🗐
Safe Room Resources CD (FEMA 388-CD – revised March 2009)		✔	✔	⊙
Engineering Principles and Practices for Retrofitting Flood-Prone Residential Buildings (FEMA 259 – January 1995)	✔		✔	💻 🗐
Risk Management Series				
Natural Hazard RMS Publications				
Handbook for Rapid Visual Screening of Buildings to Evaluate Terrorism Risks (FEMA 455 – March 2009)	✔	✔	✔	💻 🗐 ⊙

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Table 1. FEMA Flood and Wind Publications, Training Courses, and Workshops (continued)

	Flood Damage	Wind Damage	Preparedness	Accessibility
Design Guide for Improving Hospital Safety in Earthquakes, Floods, and High Winds (FEMA 577 – June 2007)	✔	✔	✔	💻 🗐 ⊙
Design Guide for Improving Critical Facility Safety from Flooding and High Winds (FEMA 543 – January 2007)	✔	✔	✔	💻 🗐 ⊙
Design Guide for Improving School Safety in Earthquakes, Floods, and High Winds (FEMA 424 – January 2004)	✔	✔	✔	💻 🗐 ⊙
Technical Bulletins				
Technical Bulletin 0 – *User's Guide to Technical Bulletins* (TB-0 – March 2009)	✔	✔	✔	💻 🗐 ⊙
Technical Bulletin 1 – *Openings in Foundation Walls and Walls of Enclosures* (TB-1 – August 2008)	✔		✔	💻 🗐 ⊙
Technical Bulletin 2 – *Flood Damage-Resistant Materials Requirements* (TB-2 – August 2008)	✔		✔	💻 🗐 ⊙
3-93 Non-Residential Floodproofing – Requirements and Certification (FIA-TB-3 – April 1993)	✔		✔	💻 🗐 ⊙
4-93 Elevator Installation (FIA-TB-4 – April 1993)	✔		✔	💻 🗐 ⊙
Technical Bulletin 5 – *Free-of-Obstruction Requirements* (TB-5 – August 2008)	✔		✔	💻 🗐 ⊙
6-93 Below-Grade Parking Requirements (FIA-TB-6 – April 1993)	✔		✔	💻 🗐 ⊙
7-93 Wet Floodproofing Requirements (FIA-TB-7 – December 1993)	✔		✔	💻 🗐 ⊙
8-96 Corrosion Protection for Metal Connectors in Coastal Areas (FIA-TB-8 – August 1996)	✔		✔	💻 🗐 ⊙
Technical Bulletin 9 – *Design and Construction Guidance for Breakaway Walls* (TB-9 – August 2008)	✔		✔	💻 🗐 ⊙
10-01 Ensuring that Structures Built on Fill In or Near Special Flood Hazard Areas are Reasonably Safe From Flooding (FIA-TB-10 – May 2001)	✔		✔	💻 🗐 ⊙
11-01 Crawlspace Construction for Buildings Located in Special Flood Hazard Areas (FIA-TB-11 – November 2001)	✔		✔	💻 🗐 ⊙
Tornado Recovery Advisories				
Tornado Risks and Hazards in the Midwest United States (FEMA DR-1699-RA1 – August 2007)		✔	✔	💻

Table 1. FEMA Flood and Wind Publications, Training Courses, and Workshops (continued)

	Flood Damage	Wind Damage	Preparedness	Accessibility
Storm Shelters: Selecting Design Criteria (FEMA DR-1699-RA2 – August 2007)		✔	✔	💻
Residential Sheltering: In-Residence and Stand-Alone Shelters (FEMA DR-1699-RA3 – August 2007)		✔	✔	💻
Understanding and Improving Performance of Older Manufactured Homes During High-Wind Events (FEMA DR-1679-RA4 – April 2007)		✔	✔	💻
Understanding and Improving Performance of New Manufactured Homes During High-Wind Events (FEMA DR-1679-RA5 – April 2007)		✔	✔	💻
Flood Recovery Advisories				
Considerations for Rebuilding Your Flood-Damaged House (September 2009)	✔		✔	💻
Design Considerations for Improving Critical Facility Functionality During Flood Events (September 2009)	✔		✔	💻
Training Courses and Workshops				
Coastal Construction Workshop for Home Builders (FEMA 499)	✔	✔	✔	http://www.training.fema.gov
Introduction to Coastal Foundation Design and Construction for Local Building Officials (FEMA 550)	✔	✔	✔	http://www.training.fema.gov
Introduction to Coastal Foundation Design and Construction for Design Professionals (FEMA 550)	✔	✔	✔	http://www.training.fema.gov
The Flood Provisions of the International Code Series and ASCE 24	✔		✔	http://www.training.fema.gov
Multi-Hazard Mitigation Design Considerations (EMI 312)	✔	✔	✔	http://www.training.fema.gov
Design and Construction of Safe Rooms for Architects and Engineers (FEMA 361)	✔	✔	✔	http://www.training.fema.gov
Retrofitting Flood-Prone Residential Buildings (EMI 279)	✔		✔	http://www.training.fema.gov
Residential Coastal Construction (EMI 386)	✔	✔	✔	http://www.training.fema.gov
Design Guide for Improving Critical Facility Safety from Flooding and High Winds: Providing Protection to People and Buildings (FEMA 543)	✔	✔	✔	http://www.training.fema.gov

Table 1. FEMA Flood and Wind Publications, Training Courses, and Workshops (continued)

	Flood Damage	Wind Damage	Preparedness	Accessibility
Brochures				
Building Science for Disaster-Resilient Communities – Wind Hazard Publications (FEMA L-780)		✔		💻 🗐
Building Science for Disaster-Resilient Communities – Hurricane Hazard Publications (FEMA L-781)		✔		💻 🗐
Building Science for Disaster-Resilient Communities – Flood Hazard Publications (FEMA L-782)	✔			💻 🗐
Building Science for Disaster-Resilient Communities – Seismic Hazard Publications (FEMA L-783)			✔	💻 🗐
Reducing Flood Losses Through the International Codes: Meeting the Requirements of the National Flood Insurance Program	✔		✔	💻 🗐
Taking Shelter From the Storm: Building a Safe Room For Your Home or Small Business (FEMA L-233)		✔	✔	💻 🗐
Protect Your Property or Business From Disaster Series				
Protect Your Business from All Natural Hazards	✔	✔	✔	💻
Protect Your Property from Flooding	✔		✔	💻
Protect Your Property from High Winds		✔	✔	💻