The FEMA Building Science Branch

Fiscal Year 2013 in Review

FEMA

Cover Photo

Hattiesburg, Miss., March 1, 2013 -- This safe room came through the EF-4 tornado in perfect condition, while all the other buildings that belonged to the Hattiesburg American Red Cross were totally destroyed. FEMA has mitigation experts working in Hattiesburg with information on building safe rooms in their homes. Photo by Marilee Caliendo/FEMA

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FEDERAL INSURANCE AND MITIGATION ADMINISTRATION

The FEMA Building Science Branch: FY 2013 in Review

WHO WE ARE

The Building Science Branch, which resides in the Risk Reduction Division of FEMA's Federal Insurance Mitigation Administration (FIMA), serves as the agency's technical services bureau. The Branch is staffed by highly skilled national experts on building codes, proper construction techniques, and rebuilding strategies. The Branch and its partners help to implement and promote the National Earthquake Hazards Reduction Program (NEHRP), the Mitigation Assessment Team (MAT) Program, the adoption of model building codes, and the delivery of numerous technical tools, publications, training, and programs and projects in support of local multi-hazard risk reduction implementation.

WHAT WE DO

The Building Science Branch has the lead role in the development, production, and promotion of more than 250 resources that incorporate the most up-to-date building codes, seismic design guidelines, and floodproofing and wind design requirements for new construction and the repair of existing buildings. These resources include publications, guidance, tools, training courses, outreach materials, technical bulletins, and recovery advisories.

This year, FEMA Building Science Branch staff won a number of awards. These included 2013 International Code Council (ICC) Community Service Awards and two gold Hermes Creative Awards. The October 2012 Building Safety Journal article, *Mitigation Saves Lives and Money*, won the gold award in the writing/publication category and the Branch won the gold award in the video/Government category for its safe room technical and testimonial videos.

September 30, 2013, Louisville, CO. Bertha Hoskins, a FEMA Mitigation Specialist, talks to a resident at a Lowe's hardware store about building materials for repairing a flood-damaged home. Photo by Patsy Lynch.

Branch staff also were featured on a February 2013 *Today Show* segment as national experts on the mitigation of a home against natural hazards.

Branch staff frequently provides technical guidance to disaster-affected areas through workshops, meetings, and other outreach events. Equally important is the deployment of MATs to conduct post-disaster engineering investigations and the Branch's work with code and standards organizations and State and local building officials to develop and encourage the adoption of disaster-resistant building codes.

Branch Products and Activities in FY 2013

- New/revised publications and software: 14
- Publications and other resources distributed to FEMA customers: 250,000
- Technical papers published in conference proceedings: 13
- Other reports and technical papers: 10
- Recovery Advisories: 9
- Flyers and Fact Sheets: 12
- Articles: 6
- GovDelivery Announcements: 20
- Best practices: 60
- Presentations at conference/meetings: 40
- Exhibitions at conferences and meetings: 45
- Training courses held: 140
- People trained: 9,000
- Helpline: 659 responses to inquiries
- Code changes submitted: 63
- Code changes approved: 29

ACCOMPLISHMENTS

The following projects, resources, and initiatives demonstrate how the Branch and its partners, working in collaboration, are continuing to make progress toward disaster loss-reduction nationwide.

Building Codes

Support for the Building Code Development Process

The Building Science Branch helps to promote disaster-resilient communities through its support of national building code and standards organizations such as the ICC. This work is a critical part of FEMA's overall mission to help the Nation prepare for and protect against all man-made and natural hazards that pose a threat to life and property.

This year, the Branch successfully proposed and defended changes to the International Residential Code (IRC). At ICC Committee hearings in Dallas, Texas, in April 2013, Branch staff submitted changes to the IRC for One- and Two-Family Dwellings to improve seismic wall-bracing requirements. FEMA and others also successfully testified against several changes that would have weakened the IRC. At a final hearing in October 2013, the full ICC membership voted on and approved the proposed changes and recommendations from the April hearings.

The Branch also had a significant role in the update of American Society of Civil Engineers (ASCE) 41-13, Seismic Evaluation and Retrofit of Existing Buildings. With Branch support, this update was able to combine two different standards, ASCE 31 for Seismic Evaluation and ASCE 41 for Seismic Rehabilitation, and eliminate numerous conflicts between the two previous standards.

The Branch is a member of the ASCE committee to develop the next edition of ASCE 24, the consensus standard referenced by the flood provisions of the International Code Series that forms the basis of State and local building codes. The ASCE 24 revision process began in 2011 and the new edition, which was completed in 2013, will be referenced by the 2015 International Codes (I-Codes). FEMA and other committee members submitted more than 200 proposed Code changes.

Building Science staff also reviewed about 30 code recommendations for ICC 700, National Green Building Standard (NGBS) Public Comment Draft. The proposed changes covered storm water management plans, material

usage, moisture control measures, foundations, and environmentally sensitive and flood hazardous areas fenestration. The 2012 ICC 700 NGBS was approved by the American National Standards Institute (ANSI) in January 2013 and is the only residential green building rating system approved by ANSI as an American National Standard.

December 6, 2013, Washington, IL. A truck is wrapped around a tree from the November 17, 2013 tornado at the Georgetown Common Apartments. Photo by Jocelyn Augustino.

In 2008, the ICC and the National Storm Shelter Association (NSSA) published ICC/NSSA Standard for the Design and Construction of Storm Shelters (ICC-500). This national consensus standard is based on design criteria included in FEMA 320, Taking Shelter from the Storm: Building a Safe Room for Your Home or Small Business, and FEMA 361, Design and Construction Guidance for Community Safe Rooms. For the update to ICC-500, FEMA submitted 18 code recommendations regarding construction documents, requirements for placement of shelters in schools and critical facilities, peer review, and a recommendation for commentary.

The Public Comment Draft of ICC 500-2014 was made available in early July 2013. ICC 500-2014 is scheduled to be completed for reference in the 2015 I-Codes. The 2015 International Building Code will require safe areas in 250 mph design wind speed zones for new schools and other critical facilities such as police stations and fire stations.

Promoting and Monitoring the Adoption of Building Codes

The Building Science Branch promotes and monitors the adoption of building codes. By doing so, it ensures that communities are adopting disaster-resistant provisions of the building codes across the United States, resulting in local resilience and better building construction in areas prone to natural hazards.

The Branch promotes building code adoption in partnership with the ICC, standards groups, the design industry, and research institutes and through cooperative agreements with the Federal Alliance for Safe Homes (FLASH), the four Regional earthquake consortia, and the Earthquake Engineering Research Institute (EERI). Branch staff also works with other FEMA programs to integrate building codes and standards in the National Flood Insurance Program and into Grants policies and requirements.

National Building Safety Month is a public awareness campaign held each May for the last 33 years. Founded by the ICC, the Building Safety Month campaign focuses on public outreach and education to increase the overall safety and sustainability of buildings through the adoption of modern building codes and the promotion of code enforcement. For the 2013 Building Safety Month, FEMA hosted community events and conducted an array of

outreach activities in support of the 2013 theme, *Code Officials Keep You Safe*.

A Presidential Proclamation for Building Safety Month was issued for the third time in 2013. The Building Science Branch championed the original effort for a Proclamation, which emphasized that building safety is a critical component of personal and public safety and the collective responsibility of the Nation to implement effective codes and standards to sustain safe and resilient structures. This year also provided Branch staff with the opportunity to tie in Building Safety Month with annual ShakeOut earthquake drills. In May, emails were sent to all ShakeOut participants on the importance of Building Safety Month and the ShakeOut website was used for messaging on Building Safety Month activities.

The Branch uses the Building Code Effectiveness Grading Schedule, a tool owned by the Insurance Services Organization, to evaluate and score local building code departments for code adoption and enforcement for insurance credit every five years. FEMA has purchased the use of the data to track the rate of code adoption and report performance to FEMA, the Department of Homeland Security, and the Office of Management and Budget. In 2012, 55 percent of the jurisdictions in hazard-prone regions (wind, earthquake, and flood) adopted disaster-resistant building codes equivalent to the International Codes. By 2013 Quarter 3, this percentage had increased to 57 percent.

September 23, 2013. Evergreen, CO. A home in Evergreen was damaged by flooding. The residents are trying to salvage their possessions. Photo by Patsy Lynch.

Training

The Building Science Branch is continually developing and updating training courses for its many audiences, conducting training in venues across the United States and via webinars, and sponsoring and hosting training through programs such as the National Earthquake Technical Assistance Program (NETAP). All told, training conducted, hosted, or sponsored by the Building Science Branch reached about 9,000 constituents in FY 2013.

October 1, 2012, Sacramento, CA. Through FEMA's NETAP, a group of emergency managers receive free technical earthquake training in FEMA's ROVER software. Photo by Jennifer Lynette.

Through NETAP, the Branch supports training in earthquake mitigation topics at the State and local level. The courses are conducted by the Applied Technology Council (ATC), under contract to FEMA, and are designed for State and local building personnel, facilities managers, and other groups.

NETAP training is provided on site, with courses typically one day or less in duration, and via webinars. In FY 2013, in-person training was provided through NETAP to about 4,500 people via 93 courses to 14 States and U.S. Territories.

Training topics are related to the mitigation of earthquake risk and include:

- Postearthquake Safety Evaluation of Buildings, ATC-20
- Rapid Visual Screening of Buildings for Potential Seismic Hazards, FEMA 154
- Reducing the Risks of Nonstructural Earthquake Damage, FEMA E-74
- Seismic Evaluation and Retrofit of Multi-Unit Wood Frame Buildings with Weak First Stories, FEMA P-807
- ROVER, Rapid Observation of Vulnerability and Estimation of Risk, FEMA P-154 CD, FEMA's software for pre- and post-earthquake building safety screening

FEMA also supported earthquake-related training through its State earthquake assistance program and through its cooperative agreements. For example, FEMA and the Central U.S. Earthquake Consortium (CUSEC) offered a ROVER webinar for more than 100 participants in July 2013 in preparation for the CAPSTONE-14 exercise. In 2013, there were more than 200 participants at the FEMA-EERI Technical Seminar Series on Next Generation Seismic Ground Motion Attenuations, held in San Francisco, Los Angeles, Seattle, and Salt Lake City. States providing training with FEMA earthquake funds included Utah (ROVER) for 35 participants and Missouri (SAVE, Structural Assessment and Visual Evaluation training) for about 200 participants.

The Branch also offered an extensive portfolio of training courses, workshops, and webinars for communities and homeowners on how to build stronger and minimize damage from wind, flood, coastal environment hazards, and wildfires. Some of the courses and workshops, which are typically offered in the field or at conferences by Branch staff, are listed on the next page.

Selected Flood and Wind Training in FY 2013

- Best Practices for Wind and Flood Mitigation, a ½-day or 1-day course offered multiple times in 2013 for administrators, architects, code officials, contractors/builders, engineers, inspectors, and plan examiners

- Coastal Construction Workshop for Home Builders, a ½-day training for construction professionals in coastal areas

- Making Critical Facilities Safe from Flooding and High Winds, a 1-day course taught in the New York City area as part of Hurricane Sandy outreach

- Floodproofing Non-Residential Buildings, a new course based on FEMA P-936, taught for the first time in August 2013

- MAT Presentation on 2011 Tornado Outbreak and Hurricane Sandy, a 1.5 hour webinar for the Natural Hazards Mitigation Association

- Training conducted by Branch partners such as FLASH, including Volunteer Organizations Active in Disaster Wind Mitigation Training in April and May 2013.

Guidance and Tools

The Building Science Branch owns the majority of the agency's publication portfolio, managing more than 250 multi-hazard publications for a variety of stakeholders, including homeowners, businesses, schools, non-profit, governmental, engineering and design professionals, and building code officials. See these links to view the Branch's publications: http://www.fema.gov/building-science-publications and http://www.fema.gov/earthquake-publications.

In addition to the FEMA-numbered publications listed on the next page, Building Science published 13 papers in conference proceedings; developed numerous flyers, web pages, guides, and fact sheets to assist State and local officials, homeowners, and design and construction professionals with mitigation and recovery in the aftermath of Hurricane Sandy; authored articles in technical and industry journals; and posted approximately 60 best practices in the FEMA Best Practices Portfolio.

November 8, 2012. Rockaway, NY. Debris from Hurricane Sandy in the Rockaway area of New York City remains on the street. Photo by Walt Jennings.

Branch publications are made available through the FEMA Publications Warehouse and online on www.fema.gov. In FY 2013, about 250,000 Branch publications were distributed to FEMA customers.

In 2012, a customer satisfaction survey was performed by the Department of the Interior Federal Consulting Group to assess overall customer satisfaction with the Branch's publications (the overall customer satisfaction was a very strong index score of 82, which is 15 points higher than the average for other Federal agencies). In 2013, year 2 of the survey, the study focused on 11 specific publications representing a mix of the Branch's typical technical guidance. The results from surveys conducted in May 2013 include the following:

- For the second year in a row, customers ordering Branch publications are very satisfied. In 2013, those who ordered at least 1 of the 11 specific publications posted a Customer Satisfaction Index (CSI) score of 84, a full 17 points above the overall government CSI score.
- CSI driver scores are performed at exceptional levels, with customers registering very favorable perceptions of Printing and Technical Quality, Ordering Process, Technical Content, and Value.
- Satisfaction with Branch publications is high across customers of all educational levels, as well as across different types of actions taken.

New and Revised Branch Publications and Guidance

- Seismic Performance Assessment of Buildings: Volume 1, FEMA P-58-1
- Seismic Performance Assessment of Buildings: Volume 2, FEMA P-58-2
- Seismic Performance Assessment of Buildings, Methodology & Implementation, FEMA P-58CD
- ROVER Version 2.0.1. Software, FEMA P-154CD
- Homebuilders Guide to Earthquake Resistant Design and Construction-Guide, Training Materials, Spanish Edition, FEMA P-232CD
- Catalog of FEMA Earthquake Resources, FEMA P-736B and FEMA P-736B CD
- 2009 NEHRP Recommended Seismic Provisions: Design Examples, FEMA P-751CD
- 2009 NEHRP Recommended Seismic Provisions: Training Materials, FEMA P-752CD
- Substantial Damage Estimator (SED), FEMA P-784CD
- Floodproofing Non-Residential Buildings, FEMA P-936
- MAT Report – Hurricane Isaac in Louisiana, FEMA P-938 and FEMA P-938CD
- Multi-hazard Mitigation and Design Concepts: Wind, Flood, and Earthquake Training Videos, FEMA P-940CD
- MAT Report – Hurricane Sandy in New Jersey and New York, FEMA P-942 and FEMA P-942CD
- Building Codes Toolkit, FEMA P-950CD
- Snow Load Safety Guide, FEMA P-957 and FEMA P-957CD

December 16, 2013. Santa Clara Sacred Mountain, NM. The Pueblo Tribe's ancient sacred lands were damaged after recent wild fires. Photo by Adam DuBrowa.

Outreach and Awareness

Awareness and education campaigns, public messaging, and other outreach activities are essential tools in the FEMA mission to help the public prepare for and protect against natural disasters. The Building Science Branch conducts and supports a broad range of outreach activities for many audiences, from awareness day events and exhibits and workshops at home building supply stores to structural animation videos and Home Hazard Hunt interactive games for kids. Each year, the Branch also exhibits and presents at numerous hazard-related conferences and expositions across the United States.

Two Branch outreach programs are described below. Information on many other Branch programs and events can be found on the FEMA website at www.fema.gov/blog-newsroom-videos-photosch.

Cooperative Agreements

In FY 2013, FEMA awarded more than $1.2 million to eligible States and territories to support the effective implementation of earthquake risk reduction activities. FEMA also continued to work in partnership with organizations such as EERI, FLASH, the Southern California Earthquake Center (SCEC), and the Regional earthquake consortia: CUSEC, the Cascadia Regional Earthquake Workgroup (CREW), the Northeast States Emergency Consortium (NESEC), and the Western States Seismic Policy Council (WSSPC). The consortia are longtime partners of FEMA and play an invaluable role in coordinating multi-State response and recovery planning and in public awareness and education. The consortia are also very active partners in the ShakeOut earthquake drills that take place in schools, businesses, and homes across the United States.

FEMA is collaborating and coordinating with these grantees to ensure substantial involvement and mutual partnership in executing local and Regional risk reduction outreach and implementation activities for earthquakes and other hazards. This includes earthquake mitigation planning, property inventory and seismic inspection of critical facilities, updating building codes and zoning ordinances, earthquake outreach and education, and the development of

multi-State groups in support of local earthquake and other multi-hazard initiatives.

ShakeOut

ShakeOut, which started in Southern California in 2008, is now serving as a framework for related outreach activities. Since 2008, ShakeOut has continued to grow exponentially. In 2013, almost 19 million people participated in ShakeOut activities worldwide, including participants from 40 States and U.S. Territories. New ShakeOuts in 2013 included the Northeast ShakeOut, the Rocky Mountain ShakeOut, the American Samoa ShakeOut, the Hawaii ShakeOut, and the Grande Secousse de Charlevois, a ShakeOut for a region of Quebec Province, Canada. The success of ShakeOut is due in part to direct financial support from FEMA NEHRP and the very active involvement and support from FEMA Preparedness, Regional staff, the Earthquake Country Alliance, SCEC, the four Regional earthquake consortia, State Earthquake Program Managers, the private sector, and many others.

September 5, 2013, Washington, D.C. During America's PrepareAthon!, the Great ShakeOut conducted earthquake drills encouraging participants to Drop, Cover, and Hold On. Photo by Brittany Trotter.

Regional Activities

The FEMA HQ Building Science Branch staff works closely with their counterparts at the Regional level to support partnerships with the States and local communities in implementing and executing NEHRP and multi-hazard risk reduction activities. On a day-to-day basis, FEMA Regional partners support local outreach, training delivery, oversight and execution of cooperative agreements, disaster operations, and technical assistance on local projects. Their active involvement and support ensures that the NEHRP mission, building codes, standards, and other building science principles are integrated in local mitigation planning, grant decisions, and other local activities.

Disaster Support

Deployment of Mitigation Assessment Teams

FEMA's 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, the teams prepare recommendations regarding construction codes and standards, building design issues, and best practices that communities and the construction industry can use to reduce damages in future disasters.

Within one week of Hurricane Sandy's October 29, 2012 landfall, FEMA and other MAT members and partners deployed to affected areas in New Jersey and New York to begin assessing the damage. Following field investigations conducted from December 5-20, 2012, Building Science staff released seven Recovery Advisories (RAs) written specifically for areas affected by Hurricane Sandy. The RAs describe mitigation measures that can be used to mitigate future flood damage to buildings. The MAT Report on Hurricane Sandy in New Jersey and New York, FEMA P-942 and FEMA P-942 CD, includes sections on single- and multi-family residential buildings, mid- and high-rise buildings, commercial and critical facilities, and historic structures.

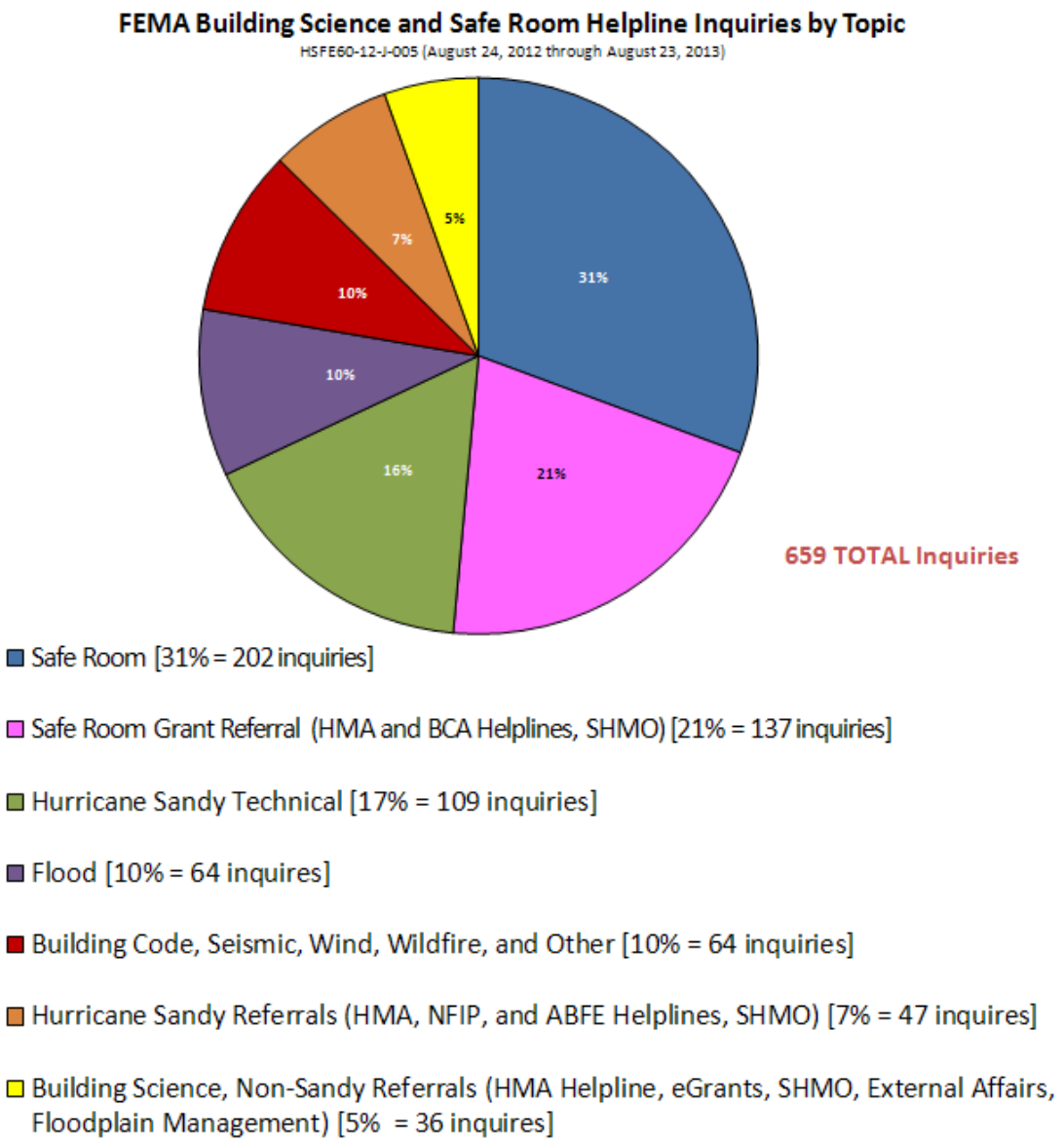
FEMA P-938, Mitigation Assessment Team Report, Hurricane Isaac in Louisiana, March 2013.

In response to a request for technical support from the FEMA Joint Field Office in Baton Rouge, Louisiana, FEMA's Mitigation Division deployed a MAT composed of national and Regional experts to affected areas in Louisiana on October 8, 2012. The MAT was charged with evaluating damage from Hurricane Isaac as well as post-Hurricane Katrina

construction and reconstruction efforts, assessing the performance of critical facilities affected by the storm, evaluating the performance of electrical distribution and communication facilities, and investigating claims of wind damage in newer buildings. The MAT's observations, conclusions, and recommendations are presented in FEMA P-938, Mitigation Assessment Team Report – Hurricane Isaac in Louisiana: Building Performance Observations, Recommendations, and Technical Guidance. The MAT studying the damages of Hurricane Isaac also developed two RAs on mitigation measures that could be taken to minimize damage to buildings.

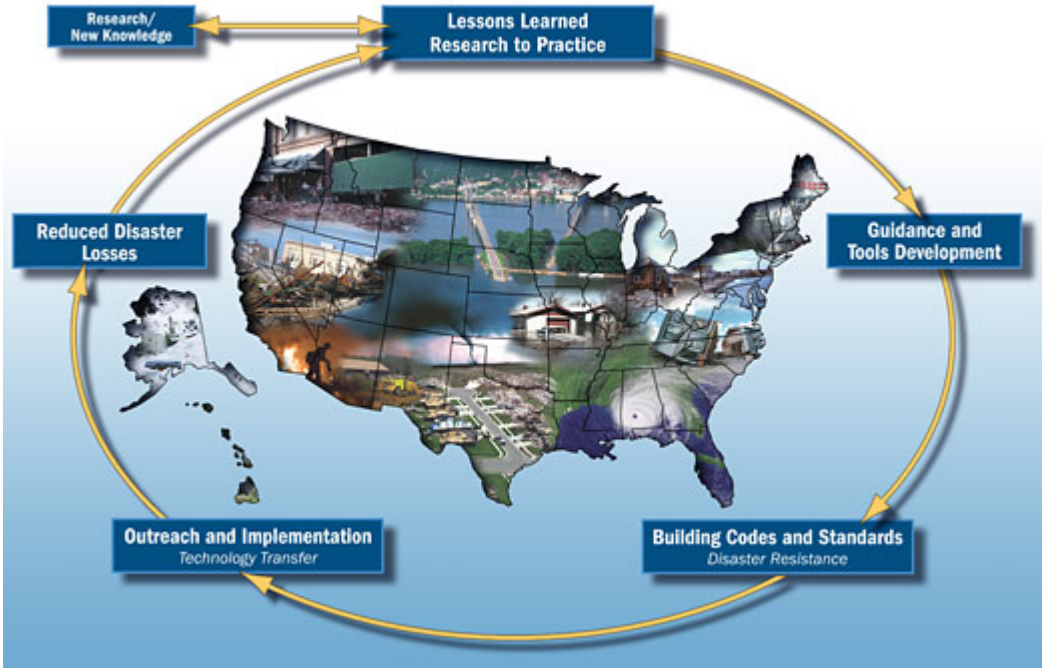
Building Science Helpline

FEMA Building Science maintains building science and safe room helplines. In FY 2013, the helplines responded to 659 inquiries related to wind and flood issues.



For More Information

For more information on FEMA's Building Science Branch and its publications and resources, and to subscribe to Building Science email updates, see http://www.fema.gov/building-science/.



For additional information on FEMA's NEHRP activities and its publications and resources, and to subscribe to FEMA NEHRP email updates, see http://www.fema.gov/earthquake/.

NEHRP | Latest Earthquakes | Earthquake Hazard Maps | Publications

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