FEMA REGION IV (BUILDING SCIENCE FACT SHEET 1 OF 2)

FEMA Building Science Considerations for Risk MAP

DECEMBER 2018

THE ROLE OF FEMA BUILDING SCIENCE: The Federal Emergency Management Agency (FEMA) Building Science Branch provides multi-hazard mitigation guidance, training, and support to help communities become more disaster resilient. This is accomplished primarily through developing state-of-the-art publications, guidance and outreach materials, tools, Technical Bulletins, Recovery Advisories, and other materials that many different audiences can use to support resiliency. The fact sheet titled *FEMA Building Science Resources to Help Reduce Risk and Improve Resilience in Region IV* provides information on some of the 200+ detailed resources available on the FEMA Building Science website and in FEMA P-787 Catalog of FEMA Building Science Branch Publications and Training Courses.

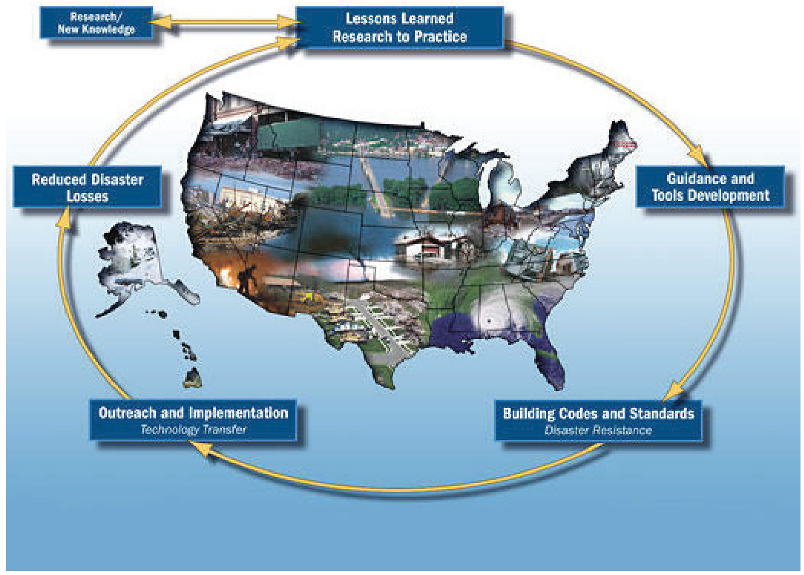
FEMA Building Science specifically supports the National Flood Insurance Program (NFIP), which requires communities to enforce minimum standards for buildings in the Special Flood Hazard Area (SFHA). FEMA Building Science provides technical support, both internal and external to FEMA, to help stakeholders understand the technical requirements for complying with the NFIP and the relationship between those requirements and the flood provisions of the model building code.

Another way FEMA's Building Science Branch provides guidance is through encouraging improved building codes and standards. The branch continuously provides proposals for code changes, or argues against code change proposals that may weaken disaster-resistant provisions of model codes and standards, in keeping with FEMA's mission to help people before, during, and after disasters.

The Mitigation Assessment Team (MAT) Program is an integral function of the Building Science Branch that continually improves FEMA's understanding of building design and ability to increase resilience. The MAT assesses and evaluates post-disaster building performance and develops recommendations to improve codes and standards, code enforcement, design or construction; identifies gaps in knowledge, testing and research; promotes best practices; and provides appropriate guidance to many different stakeholders. These include homeowners, building officials, design professionals, the building code and building industry, State and local officials, and other areas of FEMA.

Photo: FEMA/Marilee Caliendo

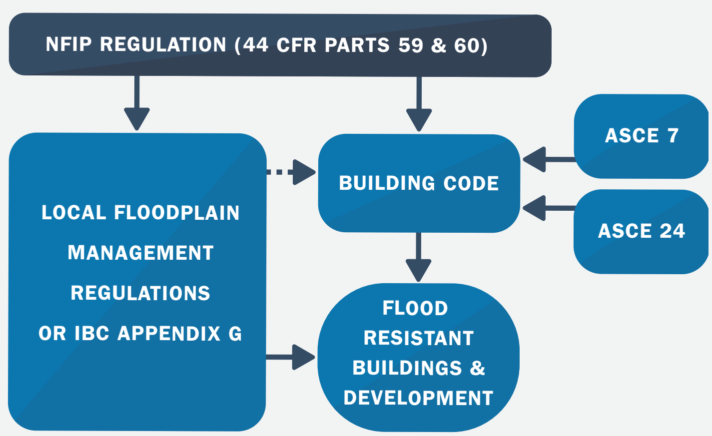
Building Science participates in various forms of outreach to communicate with different stakeholders, including the public. Training and support is provided through conferences, webinars, field deployments, classroom sessions, and the Building Science Helpline at 866-927-2104. Outreach is targeted through web-based programs and GovDelivery, among others. Building Science collaborates with many organizations, such as the Federal Alliance for Safe Homes (FLASH), Association of State Floodplain Managers (ASFPM), International Code Council (ICC), U.S. Army Corps of Engineers (USACE), Insurance Institute for Business and Home Safety (IBHS), National Association of Home Builders (NAHB), U.S. Green Building Council (USGBC), FEMA Joint Field Offices (JFOs), and Universities. The Building Science Branch also works with FEMA programs such as the NFIP, Community Rating System (CRS), Hazard Mitigation Assistance (HMA), and Risk Mapping, Assessment, and Planning (Risk MAP).



Through these initiatives, FEMA Building Science learns from others and shares new findings and information.

APPLYING BUILDING SCIENCE RESOURCES:

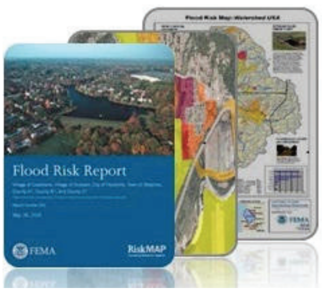
FEMA Building Science resources can help a community, property owner, or other stakeholder better understand the complexities of the disaster resilience provisions of model building codes and standards, how State or locally adopted codes and standards may differ from them, and their relationship with the NFIP and local flood ordinances. Stakeholders can then better understand the inherent vulnerabilities and risks of their building stock portfolio(s) built under previous State or locally adopted codes and standards, or no code at all. Local building and code officials enforce specific requirements for their jurisdiction. Depending on the State and their laws, some local jurisdictions must enforce the same code as the State; in other cases, they can potentially amend (either strengthen or weaken) building requirements within their jurisdiction. Regardless of State requirements, community participation in the NFIP requires the enforcement of certain minimum standards.



This graphic demonstrates the relationships between American Society of Civil Engineers (ASCE) standards, NFIP regulations, and local ordinance requirements to create resilient building codes.

USING RISK MAP TO HELP IDENTIFY VULNERABILITY AND RISK IN A COMMUNITY:

FEMA Building Science resources can enhance Risk MAP products when incorporating disaster resilience or best practices into building and utility design. Identifying the most hazard-prone locations can help determine what Building Science resources would be most beneficial in understanding vulnerabilities and risks, or in developing options for mitigation that could result in reduced flood insurance premiums. The following are just some of the Risk MAP Flood Risk Products that Building Science can help advance.



DEPTH GRIDS provide details on anticipated flood depths at certain locations. Building Science resources can help users understand the anticipated vulnerabilities and associated risks to specific buildings and their utility systems at different flood depths. From this information, stakeholders can better understand their anticipated performance and potential damage during a hazard event and help facilitate more resilient building designs.

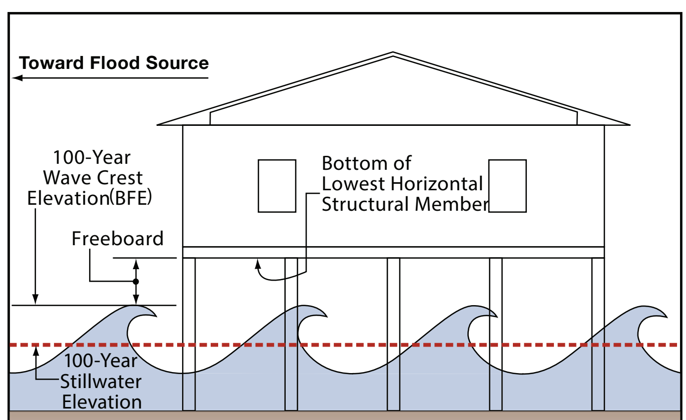
CHANGES SINCE LAST FIRM (FLOOD INSURANCE RATE MAP) datasets provide information regarding changes in the floodplain and floodway boundaries made during an updated flood mapping study. Communities can use specific Building Science resources to help understand risks, vulnerabilities, and potential mitigation measures for properties that are now at a different risk for flooding. Building Science outreach materials and training could be especially helpful for community leaders, code officials, designers, planners, and affected building and property owners.

FLOOD RISK ASSESSMENT (FRA) datasets contain flood loss estimates to help communities with benefit-cost analysis considerations and encourage the adoption of stronger codes and standards. Communities can use Building Science resources to learn about the anticipated vulnerabilities of specific structures and the benefits of potential retrofits. The Building Science Branch can also provide State Code Profiles to better understand the state of hazard-resistant code adoption in a State or Region.

COMMUNITY ENGAGEMENT AND OUTREACH are vital for sharing the benefits of using Building Science to better inform Risk MAP meetings. These provide a valuable forum for FEMA, the State, communities, and other stakeholders to work together and understand how hazards may affect their specific community, and what strategies are available to mitigate those hazards.

Pass Christian, Mississippi, home elevated on reinforced concrete columns in Zone A, with the bottom of the floor beam elevated approximately 9 feet above the BFE. Although Katrina flooding was approximately 4 feet above the top of the lowest elevated floor, the home sustained no structural damage. All other buildings in the vicinity were destroyed.

ABOVE-CODE CONSIDERATIONS: Designing and constructing above the minimum building code requirements can reduce hazard vulnerabilities to communities and improve local building stock. Some of these strengthened standards might also result in reduced flood or homeowners' insurance premiums through programs like the Community Rating System (CRS) or the Building Code Effectiveness Grading Schedule (BCEGS). Individuals, organizations, and businesses can choose to exceed minimum community code requirements to reduce their risk of potential losses or downtime to their facilities. Homeowners may feel safer in homes built above code or may view the additional measures as an investment. Some businesses use above-code buildings as a symbol for their products or work. When encouraging above-code construction, consult your local community officials for help in better understanding hazards, risks, vulnerabilities, costs and benefits for improved decision making. Risk MAP process provides an opportunity for communities to explore the benefits of building above code while engaging in discussions about flood risk reduction, mitigation planning, and long-term community resiliency. Additionally, the 2017 Interim Report from the National Institute of Building Sciences states that exceeding select standards of the 2015 model building code can save $4 for every $1 spent. Examples of above-code design and construction, all of which can potentially reduce flood insurance premiums, include but are not limited to:



Exceeding NFIP Elevation Requirements in Coastal A Zones and V Zones

ADDING FREEBOARD TO BASE FLOOD ELEVATION (BFE): Freeboard refers to adding height above the minimum base flood elevation requirements for structures or associated components of their utility systems. This helps mitigate possible increases in flood elevations associated with future conditions or with flooding events beyond the base (1-percent-annual-chance) flood. Communities can adopt ordinances to require additional freeboard. Businesses or individuals can also add freeboard to further reduce their risk of potential damage or delay in operations.

ELIMINATING ENCLOSURES BELOW ELEVATED BUILDINGS: Eliminating enclosures below buildings minimizes obstructions to the flow of floodwater, reduces the amount of debris added to floodwater, and minimizes the potential of damage. Prohibitions on enclosures can be adopted as a local ordinance, or individuals can choose to proactively build without enclosures. This might also reduce annual flood insurance premiums.

REGULATING COASTAL A ZONE CONSTRUCTION LIKE VE ZONE CONSTRUCTION: In Coastal A Zones, there is additional risk of tidal surge and moderate wave action, though the NFIP doesn't require increased development standards like those in VE Zones. Still, a growing number of communities and even the State of Florida have added language to their adopted flood ordinance or building code to mandate that VE Zone building requirements apply to structures in Coastal A Zones. Another option is to adopt ASCE 24, or more recent model building codes that reference ASCE 24, requiring VE Zone standards in Coastal A Zone design and construction. Such standards result in structures built with stronger open foundations (piles or piers), elevated horizontal structural members, and greater use of flood-resistant materials, among other features, that reduce the risk of damage from moderate wave action. A community can also earn CRS credit for these requirements while building owners may pay lower flood insurance premiums.

For specific resources demonstrating how to minimize natural hazard impacts, reference Region IV Fact Sheet 2 of 2 — *FEMA Building Science Resources to Help Reduce Risk and Improve Resilience*.

FEMA BEST PRACTICES FOR CONSIDERATION: FEMA Best Practices provide effective options for designers, builders, and other stakeholders to consider for reducing hazard-related damages or functional down time to buildings or their utility systems. Best Practices can be found in many FEMA publications, including the example below from FEMA P-936, Floodproofing Non-Residential Buildings for Lourdes Hospital in Binghamton, New York.

Lourdes Hospital in Binghamton, NY, is in the 1-percent-annual-chance floodplain of the Susquehanna River. Flooding in 2006 forced the hospital to close for two weeks and caused $20 million in damage (FEMA 2011a). Relocating the hospital was not feasible, but it was determined that a floodwall system would provide the necessary protection. The system was constructed for an estimated $7 million using funds from FEMA and New York State. The floodwall, which protects the hospital to a 0.2-percent-annual-chance flood elevation, consists of a concrete T-wall and passive floodgates at each of the 11 entry points. The gates automatically deploy during a flood, triggered by the hydrostatic pressure of the rising floodwaters. When the floodwaters recede, the gates lower to their original open position. The floodwall was completed in 2010.

In 2011, Tropical Storm Lee swept through Binghamton depositing 7.5 inches of rain in a single day. The Susquehanna River crested at 25.7 feet before receding (NOAA 2011). Despite the record rainfall, the hospital remained fully operational and experienced no flooding (see image below).

Photo: FEMA

FOR ADDITIONAL FEMA BUILDING SCIENCE INFORMATION, OR TO ASK QUESTIONS, PLEASE CONTACT ANY OF THE FOLLOWING RESOURCES:

THE FEMA BUILDING SCIENCE HELPLINE

FEMA-BuildingScienceHelp@fema.dhs.gov
(Office) 866-927-2104

FEMA REGION IV MITIGATION DIVISION
RISK ANALYSIS (RA) BRANCH
BUILDING SCIENCE PERSONNEL

John “Bud” Plisich, Civil Engineer
(Office) 770-220-5380 • (Cell) 404-354-5283
(email) john.plisich@fema.dhs.gov

Derek Fellows, P.E., Civil Engineer
(Office) 770-220-8767 • (Cell) 202-394-6144
(email) derek.fellows@fema.dhs.gov