Resiliency & Natural Hazards: Structural Solutions

Structures along the Gulf Coast are exposed to multiple natural hazards, but their risk can be lowered with the adoption of policies to promote higher construction standards. Older structures can also be retrofitted to withstand catastrophic flooding and hurricane winds. The three key strategies below can help structures hold up to the elements.

- Location
- Wind Resistance
- Floodproofing

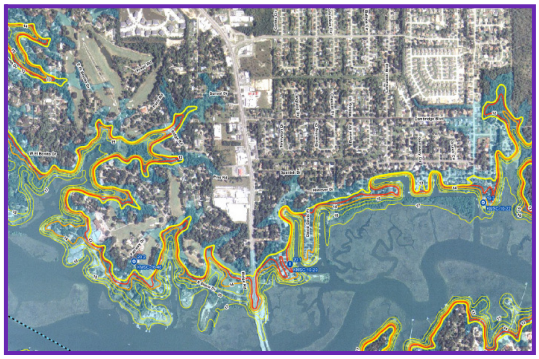
Policies to mitigate structural damage must begin with knowledge of the risks of different hazards and the level of risk that jurisdictions and property owners are willing to tolerate.

Location of Structures

Local development regulations are key tools communities can use to protect their population from a disaster. Whereas FEMA's flood maps delineate the areas of highest risk and establish the cost and availability of flood insurance for property in each zone, a local zoning or subdivision ordinance regulates the location, type and intensity of land use. The National Flood Insurance Policies' Community Rating System (CRS) provides guidance on measures to take and rewards communities that adopt stricter standards for construction with lower flood insurance rates. When a community is rebuilding after a disaster, setbacks and other zoning tools can help guide the property owner to place their structure in the safest part of the lot. Floodplain ordinances can also establish special protective requirements in designated flood zone areas. Where communities have experienced severe repetitive losses, targeted property acquisition can permanently remove at-risk parcels from the development pool. On the vertical plane, FEMA's Base Flood Elevations (BFE) provide guidelines for elevation by projecting the highest level that floodwater might reach.

Wind Resistance

Preparing a structure for wind resistance should occur at the time of construction or as a retrofit to existing buildings. Several protective measures can increase resistance to heavy winds. The International Building Code (IBC) outlines wind engineering standards that can be adopted by resolution into local building codes and provide guidelines for how a building's roofs, walls, foundations, and framework should be built to resist winds of up to 150 mph. The Gulf Coast Community Design Studio in Biloxi, Mississippi designed and built a number of wind and water resistant homes (*such as the one pictured above*) based on their research of the risks on Mississippi's coast. Owners of existing buildings may need to consider wind retrofits to strengthen their structures. For a retrofit, it is important to first evaluate the condition of the home, including points of structural weakness, and recommend a path of action based upon the characteristics of the building. Some of the most effective strategies for improving a current home include upgrading the roof system, strengthening vents, and protecting doors and windows by installing shutters or replacing glass with impact-resistant covering that stands up to flying debris.



Aerial photo of FEMA Base Flood Elevations for a coastal community.

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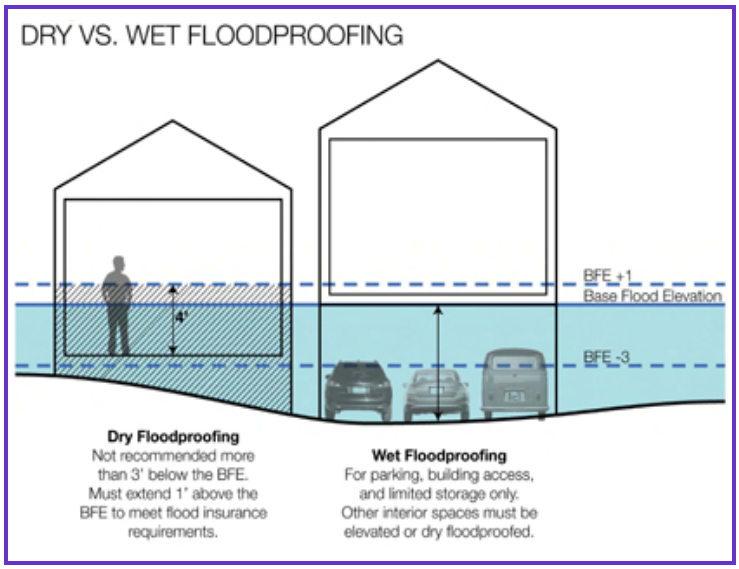
Floodproofing

Elevation above FEMA's Base Flood Elevation (BFE) is the best method to ensure structures stay dry during heavy rains or storm surge. Communities may adopt BFEs to govern new construction and even require another foot or more of additional clearance space above it. When elevating a structure to the recommended height isn't enough, wet or dry floodproofing is an acceptable mitigation option for non-residential structures. Wet flood-proofing allows floodwaters to flow in and back out, equalizing pressure on the building. This technique is appropriate for warehouses and other structures without extensive IT systems or special finishes. Dry flood-proofing keeps the water out, but results in greater pressure on the building. This technique requires extra reinforcement of the building's foundation, framework, and roof as well as special attention to the connections that hold each component together.

Images provided by Gulf Coast Community Design Studio.



Tools

Actions	Policies • Tools • Techniques
Build More Resilient Communities with Smart Land Use Policies	Minimize risks in land use planning Reduce social and economic effects of natural disasters Adopt land use guidelines to minimize flood damage Research mitigation strategies for specific natural hazards
Create a Range of Housing Opportunities and Choices	Create resilient communities by building stronger homes Build back better by applying architectural and engineering standards during the rebuilding process Build new homes to withstand floods Retrofit existing homes to withstand high winds by choosing the proper materials and techniques for coastal construction

**For a complete list of tools and resources, please see the "Tools & Resources Index" section of the Smart Growth and Sustainability Toolbox.*