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Institute for
Business &
Home
Safety®

KATRINA: 10 YEARS LATER

IMPROVING THE RESILIENCE OF ROOFING IN THE GULF STATES

AUGUST 2015

2005 was the most active hurricane season in recorded history. Four major hurricanes¹ made landfall that year in the U.S.—Dennis, Rita and Wilma, and the deadliest and most expensive to strike our country since 1928, Hurricane Katrina. Tragically, Katrina was responsible for 1,833 deaths, \$41 billion in insured losses² and overall economic losses estimated at \$151 billion³. The areas hardest hit by Katrina were the coastal counties and parishes in Alabama, Louisiana and Mississippi.

During the decade since Katrina, many things have changed along the Gulf Coast including enactment of stronger building codes, standards and requirements in a number of areas. The Insurance Institute for Business & Home Safety (IBHS) has examined changes specific to roofing requirements during the last ten years in these communities. IBHS researchers evaluated and analyzed several key aspects of roofing regulations, such as building codes, contractor licensing, permits and inspections.

In order to assess roof regulation improvements along the Gulf Coast, IBHS collected and analyzed data from 40 of the 42 coastal communities in Alabama, Louisiana and Mississippi with populations of at least 10,000. Research focused on residential roofing construction-related requirements in place before Katrina struck (2004–2005) compared to current requirements. IBHS obtained limited BuildFax and ISO data that was used as a check against reported data. No contradictions were discovered based on the data available.

¹The National Hurricane Center defines major hurricanes as storms that reach maximum sustained 1-minute surface winds of at least 50 m/s (111 mph), which is the equivalent of category 3, 4 and 5 on the Saffir-Simpson Hurricane Wind Scale.

²Insurance Information Institute, *Catastrophes: U.S.*, www.iii.org/fact-statistic/catastrophes-us.

³U.S. Census Bureau, *FFF: Hurricane Katrina 10th Anniversary: Aug. 29, 2015*, www.census.gov/newsroom/facts-for-features/2015/cb15-ff16.html.

BACKGROUND

The roof is actually a system made up of several different components that provide a building's first line of defense against Mother Nature. It is the largest, most important system in every building, yet it is also the most vulnerable during severe weather events. For example, a home or business with excellent window and other opening protection can easily be transformed into what is essentially a big bucket if the roof is damaged during a hurricane, allowing punishing wind and water inside. A Roofing Industry Committee on Weather Issues, Inc. (RICOWI) report⁴ by damage assessment teams who surveyed areas after Katrina highlighted that uplift forces produced by wind affect not only roof covering, but the roof deck and other components of the roof system as well. Functional performance requirements for a roof system depend on elements such as the roof deck, underlayments, fasteners and roof covering, all of which act as a composite system to keep water out.

Building Codes

Residential building codes are minimum life safety standards used in the design, construction and maintenance of homes. Codes are intended to increase the safety and integrity of homes to reduce deaths, injuries and property damage from a wide range of hazards. Codes preserve the built environment and reduce the need for, and cost of, public and private disaster aid. Preserving the built environment also helps communities reduce their carbon footprint by avoiding the need to repair and rebuild structures following a disaster.

Modern codes provide economies of scale in the production of building materials and construction of buildings. These uniform construction standards contribute to the durability of buildings, ensuring the structural strength of roof covering, fire resistance, adequate light and ventilation. All of these things help maintain quality of life and property values. Homes that are built using stronger building codes should be less vulnerable to the effects of severe weather events, which should make property damage less likely and less intense. Less damage results in lower cost and/or fewer insurance claims, which is exactly what IBHS researchers found when they conducted a post-disaster field investigation following Hurricane Charley, which struck Florida's west coast in 2004.

IBHS focused on whether, and by how much, codes and standards adopted since Hurricane Andrew (1992) resulted in fewer and less expensive insurance claims. Results show that well-enforced, modern, engineering-based building codes made a positive impact on the performance of homes during Hurricane Charley. The frequency (number) of claims for damage from this storm to houses built after 1996 was reduced by 60 percent compared to pre-1996 homes, and the severity (cost) of claims was reduced by 42 percent for homes built after 1996.

Regardless of when a home was built, roof damage was the most frequent building component that suffered damage during Charley, with an average of more than 90 percent of claims including roof-related damage.

It is important to note that while strong building codes help manage hurricane risk, they do not eliminate it. In addition, although building codes provide vital life safety protections, it is possible to incorporate stronger property protections when building a new home or retrofitting an existing home. IBHS created the FORTIFIED program to provide building designers, builders, contractors, and other stakeholders with comprehensive guidance about how best to address natural hazards.

FORTIFIED Home™ is a national, third-party verification program designed by IBHS that uses a unique systems-based method for creating stronger, safer homes. IBHS FORTIFIED Home™—Hurricane employs an incremental approach toward making new and existing homes more resistant to damage from hurricanes, tropical storms, high winds and wind-driven rain. With three levels of FORTIFIED Home designation available—Bronze, Silver and Gold—builders and contractors can work with homeowners to choose a desired level of protection that best suits their budgets and resilience goals.

Several states, including Alabama, Georgia, Mississippi and North Carolina, have recognized the benefits of this program by providing for insurance and other financial incentives (such as tax credits) that can reduce home ownership costs and/or retrofitting expenses.

⁴Roofing Industry Committee on Weather Issues, Inc., *Hurricane Katrina Wind Investigation Report*, www.ricowi.com/docs/reports/RICOWI_Katrina_Report.pdf

KEY FINDINGS & BEST PRACTICES

Building officials in selected jurisdictions were surveyed by IBHS; their responses were compared to best practices developed by IBHS regarding roofing contractor licensing and permitting, as well as inspections of roofing projects, as outlined below.

Building Code Adoption History

KEY FINDINGS

- Building codes in these areas have been substantially improved, with 100 percent of surveyed jurisdictions currently enforcing either the 2012 or 2009 edition of the International Residential Code® (IRC). Prior to Katrina, only about one-third (36 percent) of coastal communities surveyed were known to enforce the IRC. (See Figure 1.)
- Only three of the jurisdictions surveyed have adopted (and one is in the process of adopting) a high-wind building code supplement with enhanced roofing requirements. These supplements employ code-plus construction techniques that meet IBHS' FORTIFIED Home–Hurricane program requirements.

BEST PRACTICES

- While codes have improved, coastal jurisdictions should consider adopting IBHS FORTIFIED Home–Hurricane roofing construction standards, which are stronger than all the building codes currently being enforced in these areas.

- Sealing the roof deck should be required to prevent water damage in the event the roof cover is damaged during severe weather. One of the five methods in IBHS' FORTIFIED Home–Hurricane roofing construction standards should be used, and documentation, including photos, of the installation should be required.
- Roof coverings on buildings in hurricane-prone locations should be high-wind rated. For example, asphalt shingles (used on the majority of U.S. homes) should conform to one of the following test standards: ASTM D7158, Class H, or ASTM D3161, Class F.
- Roof sheathing fastening should be done in accordance with, or be superior to, current code requirements. Also, ring shank nails should be required by state or local building codes to improve uplift capacity of roof element connections. Ring shank nails have ridges or grooves and look more like screws than smooth nails. The ridges act as wedges to keep the nail firmly in place so that it cannot pop out. IBHS engineers estimate that using ring shank nails to attach roof sheathing doubles the strength of a roof when high winds try to tear it apart.

Licensing Requirements for Roofing Contractors/Installers

KEY FINDINGS

- More than half of jurisdictions surveyed (23) require some type of licensing or registration for roofers.
- Unlicensed roofing work is allowed below an established financial amount in some jurisdictions. For example, in certain communities, no license or registration is required to perform work for projects valued at less than \$2,500, while in others, work valued at less than \$10,000 can be performed without a license.

BEST PRACTICES

- Roofing contractors should be licensed in order to prevent work being performed by people not qualified to do so.
- In addition, homeowners should choose roofing contractors who participate in a manufacturer's certification process or a manufacturer-approved roofer designation program.

KEY FINDINGS & BEST PRACTICES

Permit Requirements for Roofing Projects

KEY FINDINGS

- Prior to Katrina, 38 percent of jurisdictions surveyed were known to require permits for re-roofing projects; today, this number has nearly doubled to 70 percent.
- Most communities surveyed allow homeowners (rather than a contractor) to get a roofing permit, which is a backdoor to allowing unlicensed installers to perform work.

BEST PRACTICES

- Roofing contractors, not homeowners, should be required to pull permits for re-roofing projects so they can be held responsible for the quality of the installation.

Inspection Requirements for Roofing Projects

KEY FINDINGS

- Some jurisdictions allow roofers to submit photos of work performed, such as fastener spacing for roof sheathing attachment and taping of roof deck joints, because their building officials are not permitted to climb on roofs to inspect these items.
- In several jurisdictions surveyed, inspection of roof covers is not required, which is considered a deficiency.
- Re-roofing projects are not inspected in several communities because officials indicated it could cause project delays resulting in the possibility of additional damage while the roof is left uncovered.
- Fewer than 25 percent (nine) of coastal communities surveyed currently require inspections of roof sheathing nailing. Only eight communities require nailing to be brought up to current building code standards if it is found to be deficient due to the use of staples or spacing irregularities based on outdated codes.

BEST PRACTICES

- If building officials are not allowed on the roof during a re-roofing project, the type, spacing and condition of existing sheathing fasteners could be inspected from inside the attic
- If roof sheathing fasteners are found to be deficient, they should be required to be brought up to current or higher building code standards. For example, use of staples in high-wind zones would not be acceptable.
- Oversight and inspection during construction is important to ensure roof covering and other components of the system are installed in conformance to the code.
- The use of compliance forms with photographs taken during installation to document that a roof deck has been properly sealed and roof covering has been properly installed could be an acceptable alternative for on-site inspections of a re-roofing project. This is particularly helpful if inspections could potentially delay completion of a project and expose the home to inclement weather.

METHODOLOGY

IBHS surveyed building code enforcement offices in 42 coastal communities (18 counties and parishes and 24 incorporated cities and towns) in Alabama, Louisiana and Mississippi with a population of 10,000 or more. The surveyed jurisdictions account for approximately 90 percent of the population across all of these coastal communities. Of 42 jurisdictions surveyed, IBHS researchers were able to collect information from 40 building code enforcement offices.

The survey method consisted of personal interviews with chief building officials in each jurisdiction and, if available, a review of requirements and procedures posted on each jurisdiction's website. The survey was designed to elicit information about current residential roofing requirements (2015) versus pre-Katrina residential roofing requirements (2004–2005). The focus of survey questions included:

- Building code adoption and history.
- Roofing contractor licensing and/or registration requirements.
- Permitting requirements for new and re-roofing projects.
- Specific elements related to roof construction for new and existing, one- and two-story family homes.
- Re-roofing or recovering of existing homes.

This report catalogues changes between pre-Katrina and current residential building requirements for each category listed above.

ANALYSIS & RECOMMENDATIONS

RESIDENTIAL ROOFING REQUIREMENTS PRE- AND POST-KATRINA

Building Codes

In 2005, about one-third (36 percent) of the coastal jurisdictions surveyed for this study were known to be enforcing older versions of the International Residential Code (IRC). Now, 100 percent of these communities are enforcing either the 2009 or 2012 editions of the IRC.

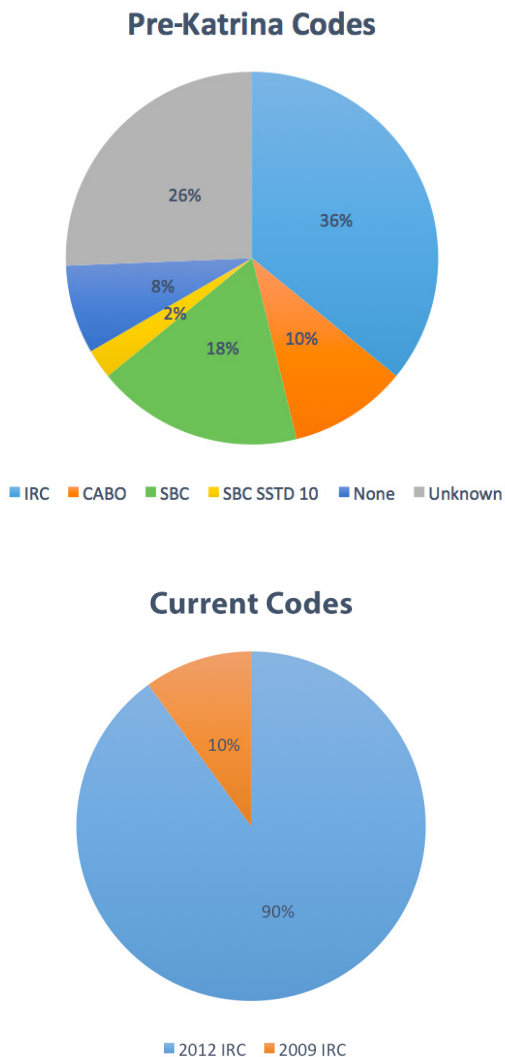


Figure 1. Residential Building Codes Adopted in Surveyed Communities

Roofing Contractor Licensing Requirements

Nearly 60 percent of jurisdictions surveyed reported they now require roofing contractors to have some type of licensing or registration, compared to about 45 percent prior to Katrina. (See Figure 2.)

Some jurisdictions allow unlicensed roofing work to be performed on projects valued at less than \$2,500, which would include most repairs. Others allow unlicensed roofing work to be performed on projects valued at up to \$10,000, which could include re-roofing on many homes. Failing to require any licensing or registration can result in roofing work being done by people who are not qualified, to the detriment of the homeowner.

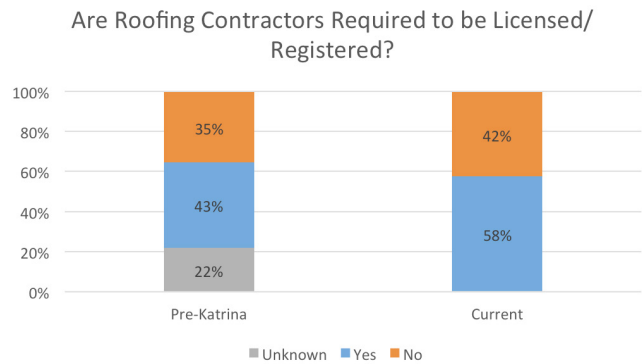


Figure 2. Percentage of Communities Requiring Roofing Contractors to be Licensed/Registered

Permit Requirements

Prior to Katrina, 75 percent of jurisdictions surveyed reported to have required permits for new construction (see Figure 3); 68 percent reported to have required them for renovations or additions (see Figure 4); and only 38 percent reported to have required permits for re-roofing (see Figure 5). All 40 communities (100 percent of those surveyed) now require permits for new construction, renovations or additions. In addition, 70 percent now require permits for re-roofing; this is almost twice as many communities as before Katrina struck (see Figure 5).

ANALYSIS & RECOMMENDATIONS

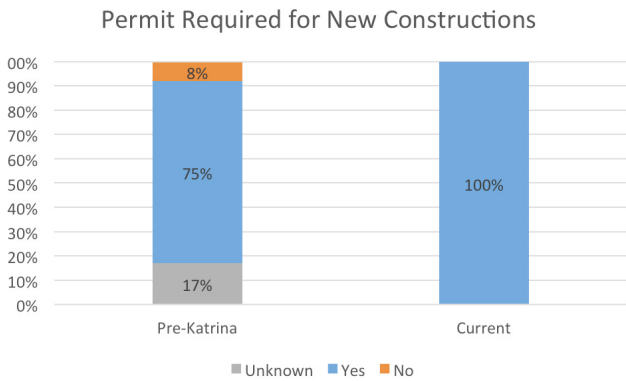


Figure 3. Percentage of Communities Requiring Permits for New Construction

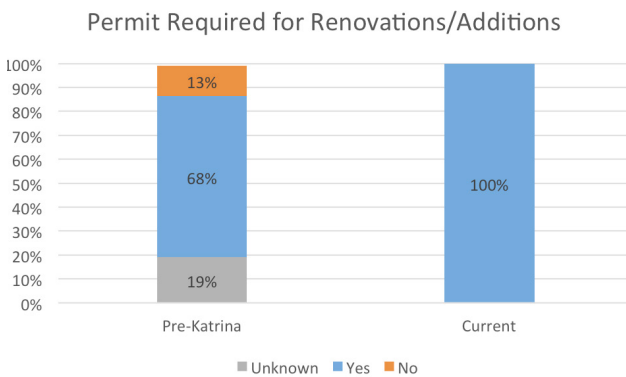


Figure 4. Percentage of Communities Requiring Permits for Renovations/Additions

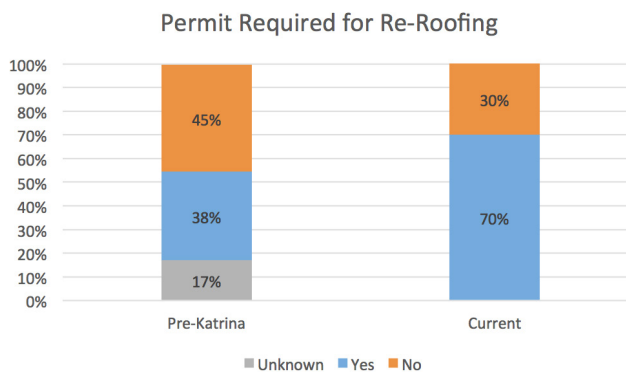


Figure 5. Percentage of Communities Requiring Permits for Re-Roofing

Inspection Requirements for New Roofs

Good building codes have little value if they are not enforced. Local government plan reviewers and building inspectors are vital to the success of building codes being correctly implemented on construction sites, and to overall building

safety. Unless these functions are adequately funded and staffed with qualified, trained, and certified personnel, the full value of building codes will not be realized.

In particular, inspections play a critical role in ensuring building code requirements and standards are properly implemented and enforced. There has been a substantial improvement among jurisdictions surveyed with regard to inspections of roofing done in connection with new construction projects. Seventy percent of jurisdictions require three different elements of new roofing projects to be inspected compared to only 15 percent known to do so prior to Katrina.

Specifically, of those communities surveyed, 83 percent currently require roof sheathing to be inspected today, compared to only 23 percent known to have required this inspection before Katrina (see Figure 6). Fully 80 percent of jurisdictions now require the attachment of roof sheathing to be inspected, compared to 20 percent known to have required this inspection prior to Katrina (see Figure 7). Finally, 78 percent of communities now require the inspection of roof covering, while just 23 percent reported to have required this inspection before Katrina (see Figure 8).

Some jurisdictions allow contractors to submit photos of work performed, such as fastener spacing for roof sheathing attachment and roof deck taping, because their building officials are not permitted to climb on roofs to inspect these items. Some jurisdictions also require a compliance form to be completed by the roofing contractor to augment the photos taken during construction. Inspecting roof covers is not required in some jurisdictions, and is therefore random and inconsistent.

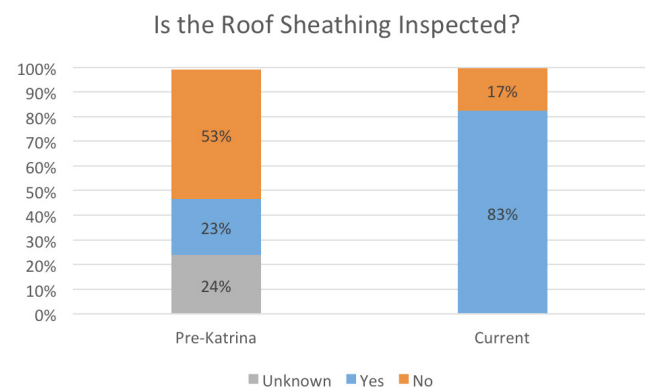


Figure 6. Percentage of Communities Requiring Roof Sheathing Inspection for New Construction

ANALYSIS & RECOMMENDATIONS

Is the Roof Sheathing Attachment Inspected?

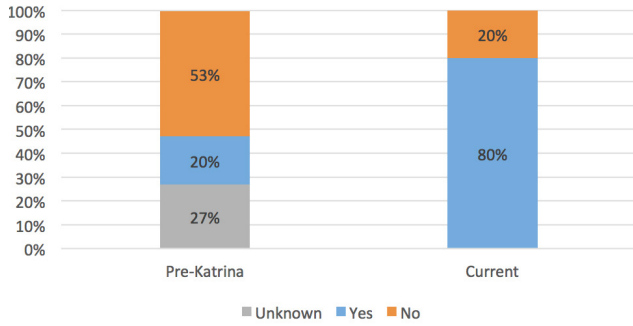


Figure 7. Percentage of Communities Requiring Roof Sheathing Attachment Inspection for New Construction

Is the Roof Sheathing Attachment Inspected?

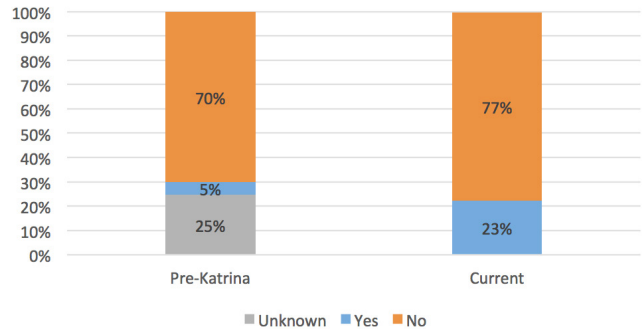


Figure 9. Percentage of Communities Requiring Roof Sheathing Attachment Inspection when Re-Roofing

Is the Roof Covering Inspected?

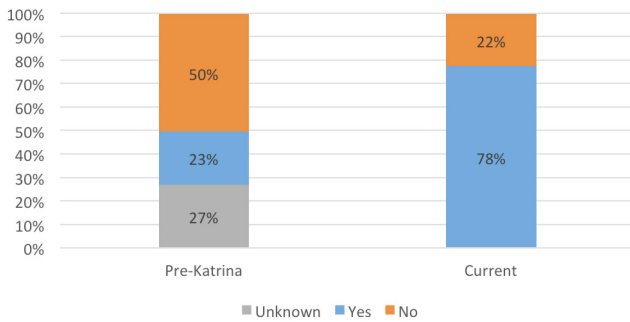


Figure 8. Percentage of Communities Requiring Roof Cover Inspection for New Construction

Is the Roof Covering Inspected?

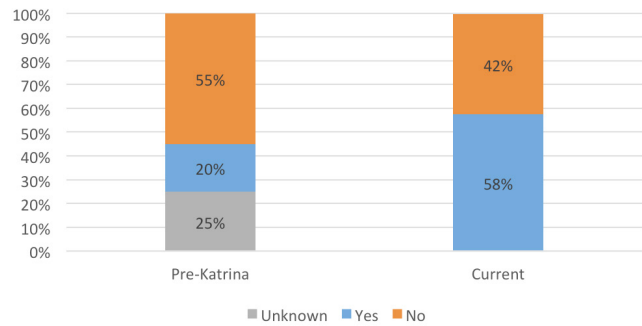


Figure 10. Percentage of Communities Requiring Inspection of Roof Covering when Re-Roofing

Re-Roofing Inspection Requirements

Re-roofing projects are not inspected in 77 percent of communities surveyed; several building officials indicated it could cause project delays resulting in the possibility of additional damage while the roof was left uncovered. Fewer than 25 percent (nine) of the coastal communities surveyed currently require inspections of roof sheathing nailing when a home is being re-roofed (see Figure 9). However, more than twice as many communities require roof cover inspections following re-roofing than were known to require these inspections prior to Katrina (see Figure 10). Only eight communities (20%) require fastening to be brought up to current building code standards if it is found to be deficient due to the use of staples or spacing patterns based on outdated codes (see Figure 11).

Are Roof Sheathing Attachments Inspected and Brought up to Current Code Requirements

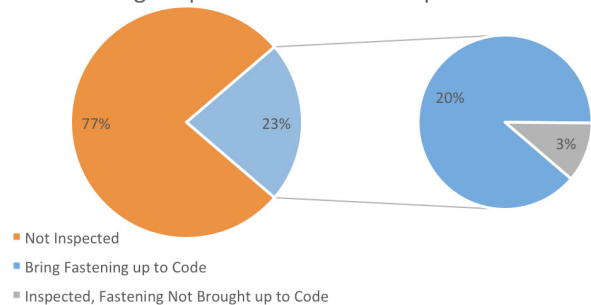


Figure 11. Percentage of Communities Requiring Roof Sheathing Attachment to be Inspected and Brought up to Current Code when Re-Roofing

ANALYSIS & RECOMMENDATIONS

IBHS Recommendations

There are practical steps that any jurisdiction can take to improve the ability of residential roof systems to protect against high winds and wind-driven water intrusion. Based on many years of pre- and post-disaster field investigation, as well as unique, rigorous building science conducted at the IBHS Research Center, IBHS has the following recommendations for any coastal community exposed to hurricane risk.

- While codes have improved, coastal jurisdictions should consider adopting IBHS FORTIFIED Home–Hurricane superior roofing construction standards, which provide increased resilience through stronger construction techniques, and are specifically developed for these areas.
- Thanks to the efforts of a local nonprofit promoting resilience, Smart Home America, and receptive building officials and construction trades, Alabama has 12 coastal jurisdictions that have adopted IBHS’ FORTIFIED Home–Hurricane standards for new residential construction, including using ring shank nails to attach roof sheathing, sealing the roof deck, and other requirements. Most of these jurisdictions also require that re-roofing projects include the re-fastening and sealing of the roof deck, and that documentation of these components is provided. Three of these communities have populations of greater than 10,000 and are included in the communities surveyed as part of this study.
- As an example, sealing the roof deck should be required to prevent water damage in the event the primary roof cover is damaged during severe weather. One of the five methods in IBHS’ FORTIFIED Home–Hurricane roofing construction standards should be used, and documentation, including photos of the various steps of the installation, should be required.
- Roof coverings on buildings in hurricane-prone locations should be high-wind rated. For example, asphalt shingles (which are installed on the majority of houses in the U.S.) should conform to one of the following test standards: ASTM D7158, Class H, or ASTM D3161, Class F.
- The fastening of roof sheathing should be done in accordance with or above current code requirements, and ring shank nails should be required to increase the uplift capacity of the roof, making it stronger during high winds.
- All roofing contractors should be licensed in order to prevent work being performed by people not qualified to do so.
- Homeowners should choose roofing contractors who participate in a manufacturer’s certification process or a manufacturer-approved installer designation program.
- Roofing contractors, not homeowners, should be required to obtain permits for re-roofing projects so they can be held responsible for the quality of the installation.
- In the event building officials are not allowed on the roof due to their department policy, the fastener spacing of sheathing during a re-roofing project should be inspected from the attic. Photographic documentation of the work by roof installers would also be an alternative.
- If roof sheathing fasteners are found to be deficient, they should be required to be brought up to current or higher building code standards.
- The use of photographs to document that roof deck joints have been properly sealed and roof covering has been properly installed is an acceptable alternative for on-site inspections of a re-roofing project. This is particularly important if inspections could potentially delay completion of a project and expose the home to inclement weather.
- Use of compliance forms completed by the roofing contractor and augmented by photographic evidence taken during roofing, can provide extra protection to the homeowner.

While hurricanes will continue to threaten the Gulf and/or Atlantic Coasts year after year, there is no reason to allow homes to remain brittle and vulnerable to damage from even relatively low-level storms. Building codes and standards can and should be improved to pay particular attention to “getting the roof right.” In addition, contractors upon whom consumers and insurers rely on to do just that, should be educated and licensed, so that new and repaired roofs perform as expected over time, and abusive, storm chasers are not allowed to take advantage of homeowners in a time of loss and stress. IBHS believes that Alabama, Louisiana and Mississippi’s coastal communities are better prepared today than they were when Katrina struck. Still, there is more work to be done to defend against storms to come.



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