Hurricane Ida – Damage Typologies Resilient Repair, Retrofit, Rebuild & Recode Version 1.0

By

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Introduction

On August 29, 2021, Hurricane Ida made landfall near Port Fourchon as a Category 4 hurricane with sustained winds of 150 mph. This is one of the most damaging and intense hurricanes to ever impact Louisiana, comparable to Hurricane Laura in 2020 and Hurricane Katrina, which made landfall on the same date as Ida in 2005.

From October 5 to the 11th, members of Sea Grant (University of Hawaii & Louisiana State University) along with Simpson Strong-Tie, National Disaster Preparedness Training Center and government officials made observations of damage in St. Charles and Terrebonne Parish, as well as Grand Isle. Damage in these areas was devastating and many people were in the initial stages of recovery and repair.

This resilience guidance on building to mitigate against hurricane damage was requested by the President of St. Charles Parish, Matthew Jewell, the Director of the Department of Homeland Security & Emergency Preparedness, Joe Ganote, and the Parish Tax Assessor, Tab Troxler. Many of the examples in this guide are from St. Charles Parish, where the major impact was from wind and rain. However, other areas affected by Ida in Louisiana were also assessed.

This guidance is general in nature and can apply to homes with similar features, no matter what the parish or state. As the homeowner or building owner contemplates the measures in this document, it is recommended that they first seek the advice of a licensed structural engineer or architect to determine applicability for their own residence as each house is different. In addition, there may be local variations in building code requirements that may impact a repair or rebuild.

This report was expedited to provide initial guidance on how to build back better to reduce the risk of damages observed during the field observations. It is a living document in that a primary goal is to get in the hands of those recovering as quickly as possible information to assist as they rebuild. In many cases, building back better may not be significantly more in cost or time. While many of the construction techniques are not currently required in Louisiana, they have become much more common-place, and in some cases mandated, in other parts of the country.

There could be a challenge in implementing some of the measures as there is typically a shortage of licensed contractors after a hurricane. This should not be different for Louisiana after Hurricane Ida. In particular, there could be shortages in supplies such as roofing materials. Supply issues could have already been a problem nationwide before Hurricane Ida and have been exacerbated by the event. At the very least, this guidance can provide the homeowner additional options to consider as they recover from the storm. This document can be used in several ways.

<u>Repair</u> – For those that experienced damage during Ida, there may be a desire not to build back in the same manner, but to build stronger to reduce the risk of damage from potential future events. There will naturally be tension between building back the same way as quickly as possible to relieve suffering and building back better, which can be more costly and time consuming. However, while the measures in this document may cost more, they are in general a drop in the bucket compared to repairing or replacing damaged property. This is something

individual homeowners should decide on. The measures in this document are in general not required but should be considered for more resilient design.

<u>**Retrofit**</u> – There are many properties that experienced no damage. It may be that they were outside the most severe wind or hazard zone. Often times, a distance of a few miles can make a large difference in the intensity, severity or impact of a natural hazard. Even though there may have been no damage, the homeowner may still decide to retrofit using some of the methods in this document when they weigh the cost/benefit, observe the impact to neighboring communities, and they realize that the next event may not be so favorable. Some of the measures in this document are not suitable as a retrofit such as changing the roof shape, while other measures can be considered.

<u>**Rebuild/Replacement**</u> – There are also properties that had major damage to the point that a house needs to be rebuilt. Houses with major damage include those where the roof has blown off or the walls blown in. When this occurs, all of the measures in this document may be considered as options for more resilient construction (e.g., changing roof shape on a new house). This may require the redesign of a new home.

<u>Recode</u> – Many of the measures in the report are not required in modern building codes, or go further than code, such as with the Insurance Institute for Business and Home Safety ("IBHS") Fortify Program. The reader is referred to the 2021 Engineered Wood Association (formerly known as the "American Plywood Association") APA report "Building for High-Wind Resilience in Light-Frame Wood Construction," which compares many of the measures in this report to minimum requirements in the 2021 International Residential Code. Louisiana has adopted provisions in the 2015 International Building Code and International Residential Code with amendments. As the State considers new building codes, the measures in this report could also be considered. However, it is not the purpose of this report to analyze the building code requirements in Louisiana.

A. Roof Shape & Gable Ends

This report is for those that want to repair their structure and for those that may need to rebuild. Generally, houses with hip style roofs did better than houses with gable end roofs. Two examples are given for houses in the same area. This is not to say that no hip style roofs suffered any damage, as some did. Performance would be a function of roof shape, location relative to the wind field, strength of framing (bracing and internal connectors), workmanship and other factors which the field work did not allow complete analysis. However, roof shape is definitely an important factor and when it is possible to build without large gable ends, performance during a hurricane should be an important factor.



Two houses at the same block in St. Charles Parish. The house on the left is two years old with a hip or cross-hip style roof. Uplift pressure on the roof is reduced due to wind creating downward pressure on the sloping faces. The house on right was built 8-10 years ago with a large gable end. The disadvantage of this design is the large forces on the wall during hurricane events can collapse the gable end, pushing the wall in or out. The advantage of a gable end is lower costs, and greater space utilization for both the interior and on the exterior (e.g., if solar panels are added). For any new houses subject to future high winds, the hip style roof should be the preferred choice.

If there are gable ends that have not been damaged, it would be appropriate to add diagonal and lateral bracing to support the ends. Adding gable end bracing is not difficult, but still a structural engineer should be consulted. There are many ways to brace a gable end. Below is a typical gable wall bracing retrofit example, but others are provided in the resources section below.



This is a typical gable end wall bracing example found in the FEMA Home Builder's Guide to Coastal Construction – P-499 Technical Fact Sheet 9.2. Also, the IBHS video referenced below, a similar method is demonstrated step by step. One difference between the two methods is the compression block is above the lower lateral brace instead of below. This may facilitate installation.

Much of the work shown here and in the IBHS video can

be done for a retrofit. For repairs and a rebuild, additional strengthening is possible by tying the gable end wall back to the structure and by adding wood structural panels such as plywood. This is shown in the APA report "Building for High-Wind Resilience in Light-Frame Wood Construction."

For larger gable ends, diagonal and lateral bracing may be more suitable using larger pieces of lumber. Here is another method to create bracing for the roof trusses and gable ends.

Protecting your roof

In most homes, gabled roofs are built using manufactured trusses. Sheets of roof sheathing, often plywood, are fastened to the trusses with nails or staples, and roofing material is fastened to the sheathing. In many cases, the plywood is the only thing keeping the trusses in place. Installing additional truss bracing makes your roof's support system much stronger.

Truss bracing

In gabled roofs, truss bracing usually consists of 2-by-4s that run the length of the roof. Braces should be installed 18 inches from the ridge in the center span, and from the base, with 8 to 10 feet between braces. Use 3-inch, 14-foot gauge wood screws or two 16-penny galvanized common nails at each truss.



Place 2-by-4s in an X pattern from the top center of the gable to the bottom center brace of the fourth truss, and from the bottom center of the gable to the top center brace of the fourth truss (see figure). Use two 3-inch, 14-gauge wood screws or two 16-penny galvanized common nails to attach the 2-by-4s to the gable and to each of the four trusses.



Additional Resources for Gable End Bracing

https://www.youtube.com/watch?v=SrYL2ooCOxA

https://www.fema.gov/sites/default/files/2020-08/fema499 2010 edition.pdf

https://sussexcountyde.gov/sites/default/files/PDFs/against_the_wind.pdf

https://www.apawood.org/publication-search?q=m310&utm_source=apaupdate&utm medium=email&utm campaign=sept-2021

B. Tying the Roof to Wall & Attempting to Complete the Load Path



The continuous load path connection ties the roof to the walls and the walls to the foundation. Each intersection has a specified connector. As mentioned above the roof to wall is vital to keep the roof on, and the house above either did not have the connection, or the connection was not strong enough. Older houses built without the benefit of modern building codes will not have a complete load path. For these houses, it is important to add as much as possible as a retrofit starting from the top down. This differs from new construction where the load path is added from the bottom up.

For many houses in St. Charles, and statewide, the roof actually blew off. When this happens, the root cause is the roof to wall connection, which was not strong enough. For new homes, damaged houses about to be rebuilt, or existing homes to be retrofitted, it is possible to fortify the roof to wall connection. This is a key connection in the structural integrity of the house, but only part of the "continuous load path connection," which is now required in modern building codes and explained below.





At left, it can be seen there are different types of roof to wall connections with some providing twice as much uplift protection (e.g., H2.5A vs. H10A). Consult with a licensed structural engineer or architect to make sure that the roof is strongly attached to the walls. This will require selecting the proper connector in terms of strength and configuration, given how the house is built. This is most easily done during new construction, and possibly during a retrofit or repair. Each house will be different. Code requirements may govern for new construction or the repair of existing structures. For retrofits that do not need to meet new code requirements,

it would still benefit the homeowner to understand what can be done to take the extra step to build as strongly as possible.

New products such as the Simpson Strong-Tie Strong Drive SDWC Truss Screw can facilitate repair or retrofit and even help to continue the load path down



to the foundation or sill plate. See the demonstration project retrofit at the Hawaii Homeowner's Handbook to Prepare for Natural Hazards 4th Edition at Section 4.1.2. It should be noted that the structural screws were primarily developed for the use in the construction of new houses but can also be used for retrofit or repair purposes. When used as a retrofit, it may be possible to continue the load path down from the exterior of the house or the interior. Again, each house is different, so consult a licensed architect or engineer before proceeding.

Once at the sill plate, it may be possible to remove the bottom two rows of siding and add holddowns and anchor bolts as a retrofit, completing the load path for older houses built without the benefit of modern building codes. It is also possible to add connectors that are stronger than required under applicable building codes.



At left, the bottom two rows of fiber cement siding were removed from the house and the following added: (i) anchor bolts to tie the sill plate to the concrete foundation, and (ii) structural screws to tie the studs to the sill plate. At right, an HDU5 Hold Down ties the stud to the sill plate to the foundation and another anchor bolt ties the sill plate to the foundation. After the



HDU5 Hold

retrofit, the fiber cement siding is attached with new sheets and painted so that there is no indication of any retrofit or repair.

The easiest retrofit connection will be for the roof to wall connection. This is the retrofit recommended first for houses without proper roof to wall ties. Going further down to complete the load path may or may not be practical in terms of time and costs, depending on the characteristics of the house. For example, it may be much easier to retrofit a single-story house vs. a two-story house for houses that do not have a load path. As with all houses, a licensed structural engineer or architect should be consulted first.

Additional Resources for the Continuous Load Path Connection

Strong-Drive® SDWC TRUSS Screw | Simpson Strong-Tie (strongtie.com)

https://seagrant.soest.hawaii.edu/homeowners-handbook-to-prepare-for-natural-hazards/

Two Reports: "The Importance of a Continuous Load Path – Lessons Learned from Recent High-Wind Events" & "Drive a New Path: Resisting Uplift with Structural Fasteners" <u>https://seblog.strongtie.com/?s=continuous+load+path</u>

Homeowners Handbook | Louisiana Sea Grant (laseagrant.org) - Part 3.2

C. Attaching the Roof Deck to the Trusses

Many roof failures in Louisiana from Hurricane Ida are associated with the plywood sheathing (roof deck) coming off the trusses. Failures are most commonly initiated at roof corners and edges, where wind pressures are greatest. The first example (right) is for a hip style roof. The second example (below) is for a gable end roof. In either case, the roof deck must be securely fastened to the trusses so there is no breach of the wind and rain resistant envelope. There are several ways to make this attachment stronger.



This can be for new roofs and repair of existing roofs, after all the shingles have been removed.



Typical attachment to the roof deck uses smooth shank nails, which have no ridges or threads on the nail. A stronger way to attach the plywood sheathing/roof deck is with ring shank nails, or screw shank nails. See the Table below. These are optional methods of attachment, designed to give the consumer more choice, with the trade-off being time and cost vs. strength. For proactive homeowners, the option of building as strong as possible should have some appeal, considering the cost and inconvenience of recovering from severe wind damage.

Potential Connectors

Ring Shank Nail	Screw Shank Nail
Better holding power than smooth shank nails. For softer	Better holding power than smooth shank nails. For
woods where splitting not an issue.	hard woods to prevent wood splitting.
Nail gunned for quicker attachment.	Nail gunned for quicker attachment.
8d (0.131" x 2-1/2")	8d (0.131" x 2-1/2")
IBHS estimates to add ring shank nails to a typical 2,000	
sq. ft. roof would add no more than a few hundred dollars.	
Costs may vary by location and there could be hurricane	
surge demand.	

The next table below shows the method of attachment or spacing under: (i) the 2021 International Residential Code (Louisiana follows the 2015 IBC and IRC with amendments), and (ii) guidance from the American Plywood Association report entitled "Building for High-Wind Resistance in Light Frame Wood Construction." Again these are options the consumer/homeowner may wish to follow with the trade-off being cost vs. strength.

Coue Requirements vs. Optional Dunu Dack Detter Guidance				
Minimum IRC 2021 Requirement	APA Recommendation from Building for			
	High Wind Resilience in Light Frame Wood			
	Construction - 2021			
No specification. Could be smooth, rink	8D Ring Shank or Screw Shank Nails			
shank or screw shank nails.	8d (.131" x 2-1/2")			
1) 4 inches on center at all locations within	1) 4 inches on center at panel ends			
48 inches of roof edges	2) 6 inches on center along intermediate			
2) 6 inches on center at panel edges	framing			
3) 12 inches on center along intermediate				
framing				

Code Requirements vs. Optional Build Back Better Guidance

Please Note the Following:

1. Consult a licensed structural engineer or architect before application to your house. Each house is different as well as the design location.

- 2. Calculation for St. Charles Parish Category II building The ultimate design wind speed is greater than 110 mph in Exposure Category C.
- 3. Calculations indicate that when comparing an 8d smooth shank nail and an 8d ring shank nail, both nails have roughly similar strength in terms of: Shear Z (nail shearing in half) and Pull Through Strength W_H (material pulling through the nail head). However, when it comes to Withdrawal Strength W (material pulling through the smooth shank or ring shank), a ring shank nail has 2.66 times the strength of a smooth shank nail (112 lbs. vs. 42 lbs.) This is why ring shank nails should be used in high wind areas as they help with roof sheathing attachment with their higher withdrawal strength and represent a small cost increase for the builder or homeowner according to the APA.
- 4. It may be possible to attach more strongly using wood subfloor screws which have even higher withdrawal strength than a ring shank nail. The problem here is to use in a quick screw attachment tool that roofers will need, the head needs to be a minimum size which gives it the same pull through strength as a rink shank nail. The design challenge is to have a screw with a larger head that can be used with quick screw attachment tools that roofers can use.

The decision by a homeowner to better attach the roof deck to the trusses is best made during new construction, or when the roof is replaced because of: i) wind damage from the hurricane, ii) roof has reached the end of its useful life, or iii) installation of solar. For homeowners that do not reroof, there are still methods to better attach the roof deck to the trusses.

It is possible to fortify the plywood sheathing roof deck by climbing into the attic and applying a quarter inch bead of subfloor adhesive to each side of the roof deck/truss intersection. This can be time consuming and a semi-difficult installation for a homeowner. It may be best to hire a licensed roofer and concentrate at the corners and roof edges first, where wind pressures are the greatest.





The Florida Disaster Organization website and FLASH recommend using a subfloor adhesive meeting AFG-01 standards. Here are examples of adhesives meeting those standards and they can be readily found at the hardware store. For more information on this method, see the links to their websites below.

Becoming more common is a closed cell polyurethane foam used for insulation at the bottom side of roof sheathing. This bonds to the structural members as well as the roof sheathing and thus add to the structural integrity of the house. The closed cell also acts as a vapor barrier, so water and moisture are less likely to get inside the house. Closed cell foam is unharmed by water damage. This is a method recommended in the Florida Disaster Website and by FLASH. It is important to differentiate between closed cell foam and open cell foam. The open cell



foam has cells that are deliberately left open and thus is softer. Open cell foam can be used for insulation as well as soundproofing, but its rigidity is not the same as for closed cell foam. Again these are options to strengthen the roof if a homeowner cannot reroof.

Additional Resources

APA Guidance Building for High-Wind Resistance in Light Frame Wood Construction https://www.apawood.org/publication-search?q=m310&utm_source=apa-update&utm_medium=email&utm_campaign=sept-2021

Florida Disaster Guidance on "What you can do if you don't re-roof" <u>https://apps.floridadisaster.org/hrg/content/roofs/cant_reroof.asp</u>

FLASH Guidance on Flood and Hurricane Home Retrofits https://hurricanestrong.org/wp-content/uploads/2021/05/5-4-21-Flood-and-Hurricane-Home-Retrofit-Options-Final.pdf

Homeowner's Handbook to Prepare for Natural Hazards - Hawaii 4th Edit. - Roofing Section 4.6

https://seagrant.soest.hawaii.edu/homeowners-handbook-to-prepare-for-natural-hazards/

Louisiana Homeowner's Handbook to Prepare for Natural Hazards https://www.laseagrant.org/sglegal/publications/other/homeowners-handbook/

D. Sealing the Roof Deck

A common type of roof damage throughout Louisiana during Hurricane Ida was to have the roof coverings, such as shingles and the underlayment blow off (right). This exposes joints in the roof deck, seen in the picture. Water infiltration through the joints in the roof deck can lead to serious interior damage (below). Two measures to address this problem are to: 1) seal the roof deck (this section), and 2) make sure shingles are properly attached to the roof deck (next section).





Without the protection of shingles or an underlayment, the joints between the plywood panels are now exposed, which can lead to water infiltration. The picture at left shows a view from inside the attic where there are gaps in the plywood deck. The gaps are in by design to allow for expansion of the sheathing. However, with no covering, wind driven rain can make the gaps major leak points in the roof. This house had no structural damage, nor did the roof deck blow off the trusses. However, when the asphalt shingles and underlayment blew off the roof deck, water infiltrated through the joints between the plywood deck. This led to the collection of water on the ceiling, which spread to the edges of the house saturating the walls. Eventually the ceiling collapsed and the whole interior of the house had to be gutted.



Problems such as these can be avoided by sealing the roof deck, especially along hips and valleys, which is not a costly or time consuming retrofit or rebuild. There are three options to seal the roof deck (see FEMA Technical Fact Sheet 7.2 in Homebuilder's Guide to Coastal Construction (FEMA P-499) and Best Practices for Minimizing Wind and Water Infiltration Damage (FEMA Hurricane Michael Recovery Advisory 2) and the table below.

Options	to	Seal	the	Roof	

Option 1 – Uses a self-adhering modified bitumen membrane (peel & stick) complying with ASTM D 1970. This is followed by a single layer ASTM D 226 Type 1 (#15) or ASTM D 4869 Type II felt.	Option 2 – Uses 4" wide self- adhering modified bitumen tape along panel seams followed by #30 felt or equivalent.	Option 3 – Uses two layers of #30 felt.			
4-toot x 8-toot root sheathing 4-toot x 8-toot root sheathing Metal drip edge Tascia Metal drip edge * Self-adhening polymer modified bitumen membrane complying with ASTM 101970 applied over the entire root. All laps to be in accordance with the manufacturer's installation instructors. *Self-Adhening Polymer Modified Bitumen Membranes: Some oriented strand board (OSB) structural panels have a factory-applied coating that can instrate with the bonding of the self-adhening modified bitumen. To facilitate bonding, a falset-applied grown is often needed. If self-adhening modified bitumen is applied to OSB, the CSB manufacturer should be contracted to determine whether a primer needs to be applied.	One layer of ASTM 0226 Type IL ASTM 02450 Type 4 text 8 feet not sheathing the d sheathing in odified blume the difference of th	The layers of ASTM 30 mone Deado Types II of ASTM 30 mone Deador no caster 10 mone Deado Types II of ASTM 50 mone Deador Control Asta II and the II of ASTM Force Asta many Gameter call asta and end taps Force Asta many Gameter call asta and end taps Force Asta many Gameter calls in the SLBS mink. Meal cap theorems not sees than 20-agage abert meal of UDI Inch for power-othere Nationers. Plass: cap addiced edge Hickless not leas than 8.030 mont.			
Estimated Cost per NAHB 2020 – for 2.900 square foot roof – costs may vary per region &					
may be higher after a hurricane considering surge demand.					
Self adhered - \$3,600-	Taped sheathing seams + 30#	#30 felt – For one layer -			
\$4,000 - #30 felt -\$650-780	felt: \$2,050-2,430.	\$650-780			
	Synthetic equivalent - \$810 to \$940				

Please Note the Following:

- 1) A sealed roof deck should be installed by a professional roofing contractor. Check licensing and background, even if out-of-state. Each state will have different licensing requirements.
- 2) Before sealing roof deck, check damaged wood sheathing and replace. Recommend stronger fastening of sheathing to trusses. Minimum to code, stronger if possible. See previous Section C.
- 3) Install drip edges at eaves/rakes, and proper flashing at roof penetrations and roof/wall intersections.
- 4) Ridge, soffit and gable vents must be properly secured and flashed.
- 5) For option 2 Used 30# felt instead of 15#, which is stronger and recommended by IBHS. IBHS also recommends drip edges above underlayment for improved wind performance.
- 6) For option 2, a synthetic equivalent can be used. Check product specifications as it should indicate if the product is manufactured to meet certain ASTM standards. For example, it may say "Physical Requirements of both ASTM D226 and D4869" or "Meets ASTM D6757, inorganic shingle underlayment standard." This appears to be a common method for some reroofing after Ida in Louisiana.
- 7) A sealed roof-deck is not required for most building codes, but may require enhanced underlayment. However, a sealed roof-deck is recommended in hurricane-prone regions such as Louisiana, and as the previous picture showed, can prevent significant damage.



This is an example of installation of Option 1 sealing the entire roof deck with the selfadhering modified bitumen membrane (peel & stick). Option 1 is the costliest yet most protective as it will protect against leaks not only at the seams of plywood sheathing, but for the entire deck. This could be important for future penetrations of the roof, e.g., installation of solar. Consult with a licensed architect.

Additional Resources

https://vimeo.com/317520187

https://ibhs.org/wind-driven-rain/building-vulnerability-to-wind-driven-rain-entry/

https://www.nahb.org/-/media/NAHB/advocacy/docs/top-priorities/codes/retrofitimprovements/retrofit-improvements-sealed-roof-deck-2020.pdf

https://www.fema.gov/sites/default/files/2020-07/minimizing-wind-water-damage_hurricanemichael_florida.pdf

https://www.fema.gov/sites/default/files/2020-08/fema499_2010_edition.pdf

Homeowners Handbook | Louisiana Sea Grant (laseagrant.org) - Part 3.3

https://seagrant.soest.hawaii.edu/homeowners-handbook-to-prepare-for-natural-hazards/ - Section 4.6

FEMA Recovery Advisory 2, June 2019 for Hurricane Michael

https://www.fema.gov/sites/default/files/2020-07/minimizing-wind-water-damage_hurricanemichael_florida.pdf

E. Properly Attaching Shingles

According to the St. Charles Tax Assessor, over 75% of the roofs in the Parish are asphalt shingle roofs. Roof damage was the most common type of damage in the Parish, as well as in the State, and the most common damage was roof shingles and underlayment blowing of the roof deck. As noted in the previous section, it is recommended that the roof deck be sealed. In addition, the shingles need to be strongly attached. The house in the photo to the right had asphalt shingles and underlayment blown off.



When reroofing because of: 1) roof damage, 2) roof has reached the end of useful life, or 3) installing a solar system, the steps are first to strip the old shingles and underlayment.

- 1) Inspect the roof deck and check there is no damage. If there is, replace the damaged deck with appropriate material.
- 2) If there are no hurricane ties connecting the roof to the wall, or they are in poor condition, or they could be stronger, apply using appropriate connectors Section B.
- 3) Make sure the roof deck is properly attached to the trusses Section C.
- 4) Create a sealed roof Section D
- 5) Properly attach the shingles this Section E.

Guidance on a more resilient method of attaching shingles can be found in the FEMA Building Science document "Home Builder's Guide to Coastal Construction," P-499 Technical Fact Sheet 7.3. Also FEMA Recovery Advisory 2, June 2019 for Hurricane Michael. Links provided below.

Some best practices for resilient construction are the following:

1) Where design wind speeds are over 120 mph, the pull through resistance of the shingle should be a minimum of 30 lbs. The shingles should have an H rating evaluated under the ASTM 7158 Classification.

- 2) Use six nails per shingle. No staples. Stainless steel nails if building within 3,000 feet of saltwater. Nails should extend through the underside of the roof deck, or a minimum of ³/₄ inch into the roof deck.
- 3) Location of the nails is important. Follow the manufacturer's nail line or nail zone. See FEMA Recovery Advisory 2, June 2019 for Hurricane Michael.
- 4) Some manufacturers provide a 130 mph warranty with the use of starter strips placed at roof edges in the beginning of installation. Between the starter strip and first course add 1 inch dabs of asphalt roof cement.





Example of installation with starter strip in black and dabs of asphalt cement between starter strip and first course in brown. This is to address the increased wind pressure at the vulnerable corners and edges of a house. This is where failure is often initiated. Refer to FEMA Technical Fact Sheet 7.3 for all details of installation, including for hips, ridges, eaves (edge parallel to the ground), rakes (edge running up to the ridge) and for all roof penetrations.

Additional Resources

Homebuilder's Guide to Coastal Construction – See Technical Fact Sheet 7.3 https://www.fema.gov/sites/default/files/2020-08/fema499_2010_edition.pdf

For an actual field installation demonstration using the methods in FEMA Technical Fact Sheet 7.3, refer to: <u>Homeowner's Handbook to Prepare for Natural Hazards Project Details | West</u> <u>Oahu Roofing Inc.</u>

FEMA Recovery Advisory 2, June 2019 for Hurricane Michael https://www.fema.gov/sites/default/files/2020-07/minimizing-wind-water-damage_hurricanemichael_florida.pdf

F. Siding

Another common type of failure is to have the fiber-cement siding blow of the house as shown to the right. While there is commonly a water barrier layer behind the siding, this can also blow off and lead to water infiltration. When attaching fiber-cement siding in high wind areas, it is important to face nail the siding and not rely on blind nailing.



From FEMA Technical Fact Sheet 5.3 – Blind nailing uses only one nail per sheet of siding per stud and the nail is hidden by the overlapping sheet. For face nailing, the siding is nailed from the top and bottom and is recommended in high wind areas. The telltale sign that the siding is

face nailed is that a nail will show at the bottom of the siding. This supposedly less esthetic characteristic does not warrant building weaker by using blind nailing techniques. Nails should also have an exterior grade coat.



Some proactive builders attach the fiber cement using the face nailing technique and also caulk the seams of the siding for additional strength.





Additional Resources

The reader is referred to FEMA Technical Fact Sheet 5.3 in the Homebuilder's Guide to Coastal Construction for additional methods of attachment for vinyl siding and brick veneer.

FEMA P-499: Home Builder's Guide to Coastal Construction

FEMA Recovery Advisory 2, June 2019 for Hurricane Michael https://www.fema.gov/sites/default/files/2020-07/minimizing-wind-water-damage_hurricane-michael_florida.pdf



G. Soffit & Fascia Damage

Another common type of damage experienced in many locations were soffits blowing off under eaves leading to water penetration in the house. The house to the left had windows protected with roll down shutters but the siding blew off to the bottom of the window and the soffits blew off at the top.

Guidance to deal with repair or retrofit of soffits can be found in Technical Fact Sheet 7.5 of FEMA's Home Builder's Guide to Coastal Construction. Some measures to strengthen the connection of soffits so that they stay in place and don't contribute to water infiltration include:

- A) Roof truss or rafter framing should extend across the bottom of the eaves, or be added to create structural support for the soffit. Alternatively attach the soffits to the undersides of angled rafters.
- B) Use nailing strips and add an intermediate strip if any spans are longer than 12" in high wind regions.
- C) A receiving channel or J-channel should cover the ends of soffit panels. Fasteners should be used through the nailing strip.
- D) The overall span of the soffit should not exceed manufacturer's specifications. Any intermediate attachments can be used.



In general, soffits should be fastened to the eave structure and should not be loose in the channels. Plywood or wood soffits are in general, adequately anchored to wood framing attached to the roof structure while vinyl and aluminum soffit panels to be installed in tracks are frequently poorly connected to the wall and fascia. Strength can be gained by installing screws that tie the soffit panels to both the fascia flashing and the wall channel. Technical Fact Sheet 7.5 also has guidance of using sealant to attach the wall channel to the wall followed by attaching the soffit to the wall channel.



Very common is the loss of the fascia cover which exposes soffits to the direct entry of wind-driven rain. Aluminum fascia covers are usually tucked under the metal drip edge and face-nailed every few feet. More frequent nailing can strengthen this attachment but could lead to warping due to thermal expansion. Vinyl fascia covers are also available and when attached to a continuous strip of utility trim placed under the drip edge, can provide a more secure attachment without thermal movement.

Below is additional guidance for improved vinyl soffit attachment from FEMA Recovery Advisory 2, June 2019 for Hurricane Michael. It can be seen the relationship of the metal drip edge, fascia, fascia cover and soffit. The fascia cover is nailed securely to the fascia and the soffit. An additional nailing strip may be required.



Additional Resources

FEMA P-499: Home Builder's Guide to Coastal Construction - Technical Fact Sheet 7.5

FEMA Recovery Advisory 2, June 2019 for Hurricane Michael

https://www.fema.gov/sites/default/files/2020-07/minimizing-wind-water-damage_hurricanemichael_florida.pdf

H. Protecting Windows

Protecting windows is one of the most important steps a Homeowner can take to prevent wind and water damage from a hurricane. If a window is broken, wind can enter a house and lead to internal pressurization which can significantly increase uplift pressure on a roof. For older homes, this may be enough to make the roof fly off. In addition, a broken window can lead to water infiltration in the house. For the photo at right, wind damage is shown by the broken windows and the damage of siding below the windows and blown off fascia to the top of the windows.



The resources below provide information on the various ways to protect windows. Some successful applications in the field are provided in this report.



To the left is a house protected with Bahama shutters. This is a common method of protection in many high wind areas. During normal conditions, the shutters are propped open to allow light and air. During a storm they are quickly closed to protect against wind borne debris.

To the right is a house protected by roll down shutters. This is also an effective means of window protection, but more expensive. Opening and closing can be done electrically, or if the power is out, manually.





The least expensive method of window protection is plywood, but this needs to be prepared before an event and can be heavy. For any covering providing window protection, the standard is to pass the large missile tests ASTM E1996 and ASTM E1886 for windows within 30 feet of grade. The small missile test is allowed for openings more than 30 to 60 feet above grade. The IBC and IRC allow plywood as an exception with 7/16 inch panels that do not span more than 8 feet. 7/16 plywood will not meet the large missile tests, but 5/8 will and thus is recommended by IBHS, unless the homeowner cannot handle the weight.

New products on the market that can facilitate window protection include polycarbonate panels. These panels are just as strong as plywood but lighter. In addition, Storm Panel Screws by Simpson Strong-Tie can facilitate deployment of plywood or polycarbonate panels. The screws come with A - a drill bit to pre-drill the screw into wood or concrete; B - hex driver to fasten the screw into the material to the interesection of the course and fine threads (blue arrow),



C – Storm Panel Screw; D – white caps which are in place during normal conditions; and E – wing nuts which attach the panel to the screw before a storm event.

Additional Resources

FEMA P-499: Home Builder's Guide to Coastal Construction - Technical Fact Sheet 6.2

Homeowners Handbook | Louisiana Sea Grant (laseagrant.org) - Part 3.4

https://seagrant.soest.hawaii.edu/homeowners-handbook-to-prepare-for-natural-hazards/

https://weather.com/safety/hurricane/news/wind-and-water-protection-article-20120330

Summary

This Quick Guide is designed to assist those in Louisiana recover primarily from wind damage from Hurricane Ida. Additional guidance may be provided for those experiencing flood and storm surge damage near the coastline. Those on the coast are likely to have experienced both wind and storm surge damage. Many of the options in this report are still applicable to those on the coast, but other measures would need to be considered including siting and elevation best practices as well.

As repeated numerous times, each house has its own idiosyncrasies, so it is best to consult a licensed structural engineer or architect before beginning any work using the methods in this report. This report should serve as a starting point, to begin discussion with licensed professionals as to how the individual homeowner may want to repair, retrofit, or rebuild given their own budget and set of priorities.

It should also be noted that many of the measures in this report go above building code requirements. It is likely that many people will be waiting for insurance money to begin repairs. Note that the insurance companies will likely pay for replacement value (i.e., what it costs to build your place to its condition before the storm). There is little chance the insurance company will pay for repairs so that you can meet current building codes, unless you have an "Ordinance or Law" provision in your insurance policy. These provisions pay for replacement of the building even if there are building code changes which making a building more expensive. It is best to read your policies carefully to determine what exactly is covered. Unlike flood policies which have little variation from State to State and are issued under the National Flood Insurance Program, wind damage is covered with private companies and the policies can vary significantly.

Since many of the measures in this report go above the code, they may not be paid for in an insurance policy. Still many of the measures are a drop in the bucket compared to paying for damages from a real event. Given prior experience, the repairs or retrofits that may be especially cost effective are: 1) roof to wall ties (Section B – first part); 2) making sure the roof deck is properly attached to the trusses when reroofing with ring shank nails (Section C); and 3) Sealing the roof deck preferably with Option 1 or at least with Option 2 (Section D). For 2 and 3, this is cost effective if the roof is already being redone because of: a) Hurricane Ida damage, b) roof has reached the end of its useful life, or c) when installing a solar system (many people re-roof before installing solar because the life of the solar may exceed the life of the roof).