



Do It Right – accept that hurricanes are a reality of living in Louisiana. **Get the Facts** about the risks you face now, and recognize that those risks are increasing as our land subsides and our coastline recedes. **Make the Choice** and the commitment to strengthen your home to reduce your vulnerability to flood, wind and water damage.

Hire a licensed contractor, and build to resist the special challenges you face living in South Louisiana.

www.BuildSaferStrongerSmarter.org

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The *Safer, Stronger, Smarter* Louisiana House

Hurricane Edition

A guide to flood, wind and water resistance
features you can see at

LaHouse
Louisiana House
Home & Landscape Resource Center



Louisiana House Home & Landscape Resource Center

LaHouse is an LSU AgCenter showcase facility on the south side of the Baton Rouge campus. It has become hub of statewide education for hazard-resistant housing, addressing the special challenges of Louisiana's natural hazards and climate.

Built Safer, Stronger, Smarter

LaHouse is a showcase for best practices and code-plus construction. Its flood and wind resistance features meet or exceed the criteria of the **Fortified for Safer Living** program of the Institute for Business and Home Safety (IBHS).

Flood

LaHouse is in Flood Zone "AE", with a Base Flood Elevation (BFE) of 24 feet. The minimum code requirement nationally for homes in Zone AE is to have the lowest floor at the BFE. Baton Rouge requires a foot above BFE, or BFE +1. The **Fortified** program requires BFE +2. The house and teaching center at LaHouse are protected to a design flood elevation (DFE) of BFE +3.

The house is elevated; the teaching center will be dry floodproofed (see Special Features). Use of flood-resistant materials and methods in some places further protects the structure, should flooding exceed BFE+3.

Wind

Baton Rouge is in the 100-110 mph wind speed zone. To meet the "Fortified" requirements, LaHouse is designed to resist the forces of 130 mph winds.

The geometry and dimensions contribute to inherent wind resistance: its length is less than twice its width; it has no more than two stories; and ceiling heights do not exceed 10 feet.

Hurricane hardware and structural sheathing tie the roof to the walls and the walls to the foundation to create a continuous load path that transfers wind forces on the house down to the ground. Roofing and other external materials are impact-resistant and installed to high-wind specifications. Windows and doors are placed so they do not impair resistance to horizontal wind forces; openings are protected either by installing hurricane-rated units or by providing external protection (impact-resistant shutters, panels and screens).

Water

South Louisiana has a hot, humid climate with average rainfall exceeding 60 inches per year. We spend twice as much time cooling homes as we do heating them. During the cooling time condensation occurs inside exterior walls. Water that is trapped in walls, keeping building materials wet, can result in mold, wood-rot and insect infestation.

LaHouse is built to:

- Shed rainwater and direct it away from the foundation.
- Catch water when it does get in through roofing, cladding or window and door frames.
- Minimize moisture penetration and condensation in walls.
- Provide drainage and drying potential for any condensate that does form.

Many of the water-resistance techniques are best construction practices; some are required by code.

LaHouse showcases multiple solutions across a range of price-points, integrating durability with other goals of sustainability: resource efficient, healthy, practical and convenient.

Special Features

Safe Room

The master bedroom closet serves as safe-room, designed to resist 150 mph wind. It is structurally isolated from rest of house. Every stud is securely fastened with hurricane straps at top and bottom. Wall and roof are clad with two layers of ¾-inch plywood installed in a staggered fashion, glued and nailed. Steel impact pocket door protects the main opening; steel in-swing door protects opening to water heater. Wood paneling (not drywall) is used for interior finish. The closet is a modified safe-room, not FEMA-standard.



Dry Floodproofing – Floodwall

Dry floodproofing is a code-compliant alternative to elevation for nonresidential buildings only. Sealants and closures must extend 1 foot above the level that would be required if elevating for the same level of protection.

ICF has a watertight installation method that was not used for LaHouse. Instead, a waterproof coating will be used as part of the synthetic stucco to ensure adequate sealing of the walls. The exposed slab will be coated with waterproofing compound. A watertight panel closure will protect the door to the breezeway. On the driveway side, a floodwall will extend out from the building and across to the driveway.

During floods, the driveway opening will be blocked with removable panels. The system will require use of a sump pump.

Breezeway Roof

A very low-pitched roof acts like an airplane wing in high winds. Because the breezeway roof at LaHouse will experience high uplift forces, the front and rear beams are heavily reinforced and firmly anchored to the walls on each end. Anchoring in the SIPS wall required a pocket and steel plate. Rafters that run along the ICF and SIPS walls have strong ties into those walls.

Porch Protection and Closets

An Armor Screen® system with an overhead track and anchor bolts in porch will protect the windows and doors that open onto the porch. Windows and doors opening onto the back porch will be protected by hurricane shutters or panels. Front and back porches have closets that can be used for easy storage of porch furniture when high winds are forecast.

Other features

The ground slopes away from the house to prevent water soaking through the foundation or creating a condition of constantly high humidity on walls.

Sewer lines have backflow valves to reduce the potential for the flooded sewer system to back up into the house.

All electrical wiring, plumbing outlets, heating, ventilation and air conditioning equipment and other mechanicals are at the same level of protection from flood as the main structure. Parts of elevated systems that must extend below BFE are designed to prevent entry of floodwater.

Water

Layering and taping of housewraps and flashings provide resistance to water and moisture penetration. Paperless drywall with a moisture-resistant core and other water-resistant materials provide extra protection from water damage. Vinyl wallpaper is avoided, so any water that does not drain from the wall can dry to the cooler, dehumidified home interior.

Drainage Planes and Vapor Barriers

- Walls have drains and vents behind bricks and sidings.
- Foil-faced foam board with taped seams provides air barrier, vapor barrier and a drainage plane behind brick veneer.
- Plastic mesh wrap provides drainage space behind fiber-cement siding.
- Crinkled stucco wrap with building paper overlay provides for drainage behind EIFS.

A perforated, semipermeable housewrap may be used under sidings that do not leach surfactants—vinyl, metal, fiber-cement.

Nonperforated housewrap is used behind brick or wood. It retains its water repellency when exposed to surfactants that can leach from these materials.

ICF does not need a drainage plane, vapor retarder or air barrier.



Windows and Doors

Wind

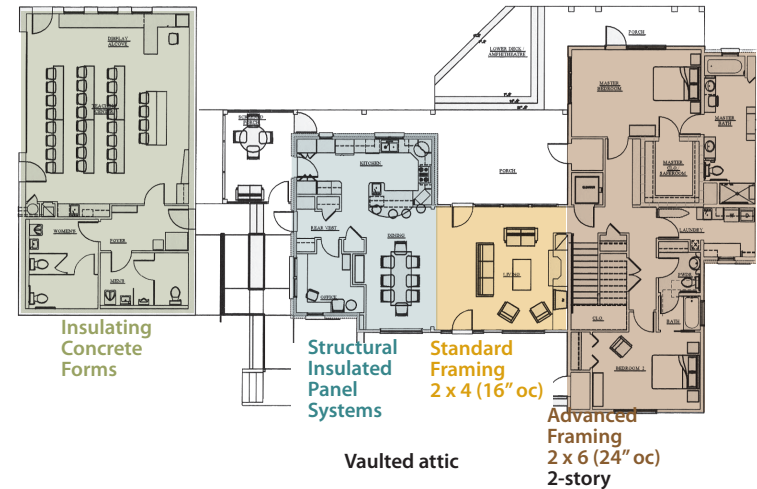
Windows are selected and sized to meet code specified “design pressure rating” (DP) for a 130 mph wind zone. In the SIPS area, windows and doors are no taller than standard 6-foot, 8-inch height. Larger openings could require additional strengthening measures. Impact-rated shutters (Bahama, colonial, roll-up, accordion), panels and screens will protect windows and doors that are not rated. Windows and doors without external protections are designed as impact units. Stained glass is shielded by a layer of impact-glass.

Water

Windows and doors are flashed to drain water outward. Sill flashings are rigid or flexible, include corner protection, and have back-dams or slope outward. Flashings are integrated shingle-fashion with the housewrap to maintain a continuous drainage plane. Seams of foil-faced OSB are taped to provide a moisture barrier, vapor barrier and drainage plane all in one.



Building Systems



Standard Framing

2x4 studs 16" on center

Most homes in Louisiana are wood framed with 2 x 4 studs. Typical practices include using extra non-load-bearing studs at corners to support wallboard, double top plates, and uninsulated headers over windows and doors. Studs in this portion of LaHouse are laminated strand lumber (LSL) and overhead joists are engineered wood I-beams.

Structural Insulated Panel System (SIPS)

Structural insulated panels combine structural framing and insulation into a single product. Rigid foam insulation is sandwiched between two structural panels, or skins. The skins, which are glued to the foam, are most commonly oriented strand board (OSB), but can be steel, plywood or cementitious material. SIPS can be cut on site or ordered from the factory with precut window and door openings and channels through the foam core for wiring. With precut panels, installation time can be less than half that of stick framing, with little construction waste. SIPS have high strength characteristics and are used for walls (4" foam) and roof (8" foam).

Advanced Framing/Optimum Value Engineered

2x6 studs 24" on center

Advanced framing reduces material and labor costs and is more energy efficient than standard framing. Floor, wall and roof framing are spaced and aligned at 24 inches on center, creating 2-foot modules. Advanced framing techniques eliminate lumber that is not necessary for load-bearing purposes. Examples of increased resource efficiency include the use of two-stud corner framing, single top plates because of the aligned stack framing, and insulated headers sized for the load-bearing need.

Insulating Concrete Forms (ICF)

ICF walls are made by stacking hollow blocks of rigid foam (as forms) and filling them with concrete. Plastic connectors, which hold the foam sides of the blocks at uniform separation, determine the thickness of concrete in the wall. Steel reinforcing bar (rebar) is placed in the cavity before the concrete is pumped in. The foam forms and plastic connectors stay in place as permanent parts of the wall assembly, thus providing a continuous insulation, acoustic and moisture barrier, as well as a backing for drywall, stucco, siding, or other cladding.

The Louisiana House – Home & Landscape Resource Center is a public-private partnership, built with monetary gifts and donated materials.

Please visit the Web site to see construction photos and lists of LaHouse key contributors, key partners and key allies on campus. You will also find directions to LaHouse and news about activities at the site.

Go to www.LSUAgCenter.com/Home and choose **LaHouse**

Foundation

Flood, Wind, and Water

LaHouse has a flood protection level 3 feet above BFE. This provides a margin of safety and qualifies for the best flood insurance rating. The house is elevated; the garage/classroom is dry-floodproofed. Sill gaskets prevent air infiltration under wood sills.

Pier Foundation (Master Bedroom)

- Block piers—filled-cell concrete masonry units (CMUs)—are steel-reinforced and anchored to continuous concrete footing, not independent pads.
- Embedded hurricane straps connect piers to floor beams and to [future] porch columns
- Deck and subfloor are treated to prevent decay



Crawlspace Foundation (Master Bath/Utility Room)

- Reinforced CMU chainwall is anchored to reinforced concrete footing
- Flood vents within 1 ft. of grade allow floodwater to flow in and out freely. Some vents have code-compliant closures
- Crawlspace ground is higher than surrounding grade so water does not collect under the house
- 6 mil plastic ground cover will reduce moisture in crawlspace
- Wood subfloor is treated to prevent decay

Slab on Back-Fill Foundation

- Reinforced CMU stemwalls are anchored to continuous reinforced concrete footings
- Reinforced concrete slab cap over compacted soil/limestone back-fill is anchored to the stemwalls with re-bar
- Durable plastic sheeting under slab and waterproofing compound on upper stemwall prevent moisture migration



Slab-on-Grade Foundation (Garage/Classroom)

- Durable plastic sheeting provides moisture barrier under slab; wraps under grade beams
- Low water-to-cement ratio concrete (fly ash, slag mix) for high strength and reduced curl.
- Wet curing blanket improves concrete strength without frequent rewetting
- Exterior coating on the slab will be part of the dry floodproofing system

Roof

Wind

Keeping the roof on is a

prime objective of the new codes. A hip roof, used for most of LaHouse, is more aerodynamically resistant to high winds than a gable roof. The roof pitch, 6:12, is strategically designed to minimize leaks and wind loads, yet ensure that water sheds away from the foundation.



Framing

Hurricane straps and clips connect rafters; straps wrap rafters, securing them to the walls. In the teaching center, hurricane hardware connects the rim band to the top



plate, which has anchors in the concrete walls. Framing lumber is secured to the rim band with hurricane straps. Soffits and soffit vents made of perforated fiber cement will be attached securely to framing members.

Decking

Except in the SIPS section, decking is 19/32-inch OSB (two-story section) or plywood

(elsewhere). Sheets are attached with ring shank nails (not staples) in a nailing pattern that is closer than customary. SIPS roof-panel seams are reinforced with embedded 2 x 8 planking.

Metal Roof

Metal roofing is impact-resistant, wind-resistant and recyclable. Hidden fasteners reduce leaks. Extra screws and edge details create 130-mph wind resistance. Panels are fabricated on site and “snap-locked” into place. High tech “cool color” coating reflects heat like a light color, saving energy and extending roof life.



Tile roof

Concrete tile looks like clay but is more impact resistant. Two wind-resistant installation methods are used:

- Mechanical fastening with screws and hurricane clips on the first course
- Large-patty foam adhesive using hip ridge boards but no battens



Water

- Peel-and-stick membrane roof underlayments provide fully adhered secondary moisture barrier under tile, extending roof life.
- Deck seams under metal roof are sealed with bitumen tape to prevent water intrusion.
- Valleys, penetrations, and seams at roof/wall intersections are flashed



Walls

Wind

Sheathing and hardware contribute to shear and uplift resistance.



Framed Sections

- Structural sheathing is 15/32-in.
- Anchor bolts hold bottom plate to slab.
- Hurricane clips tie wall studs to bottom plate.
- Metal straps tie 2nd-story studs to 1st-story studs.
- Sheathing on interior load-bearing walls.
- Seams in sheathing are backed by studs, sills or special blocking.
- Alignment of studs and rafters in advance framing section makes hurricane strapping easier and stronger.
- Exterior sheathing panels span the connection between 1st and 2nd stories.

SIPS

- Anchor bolts tie bottom plate to slab.
- Hurricane plates and extra fasteners secure wall panels to bottom plates.

ICF

Concrete wall is anchored to slab with rebar.