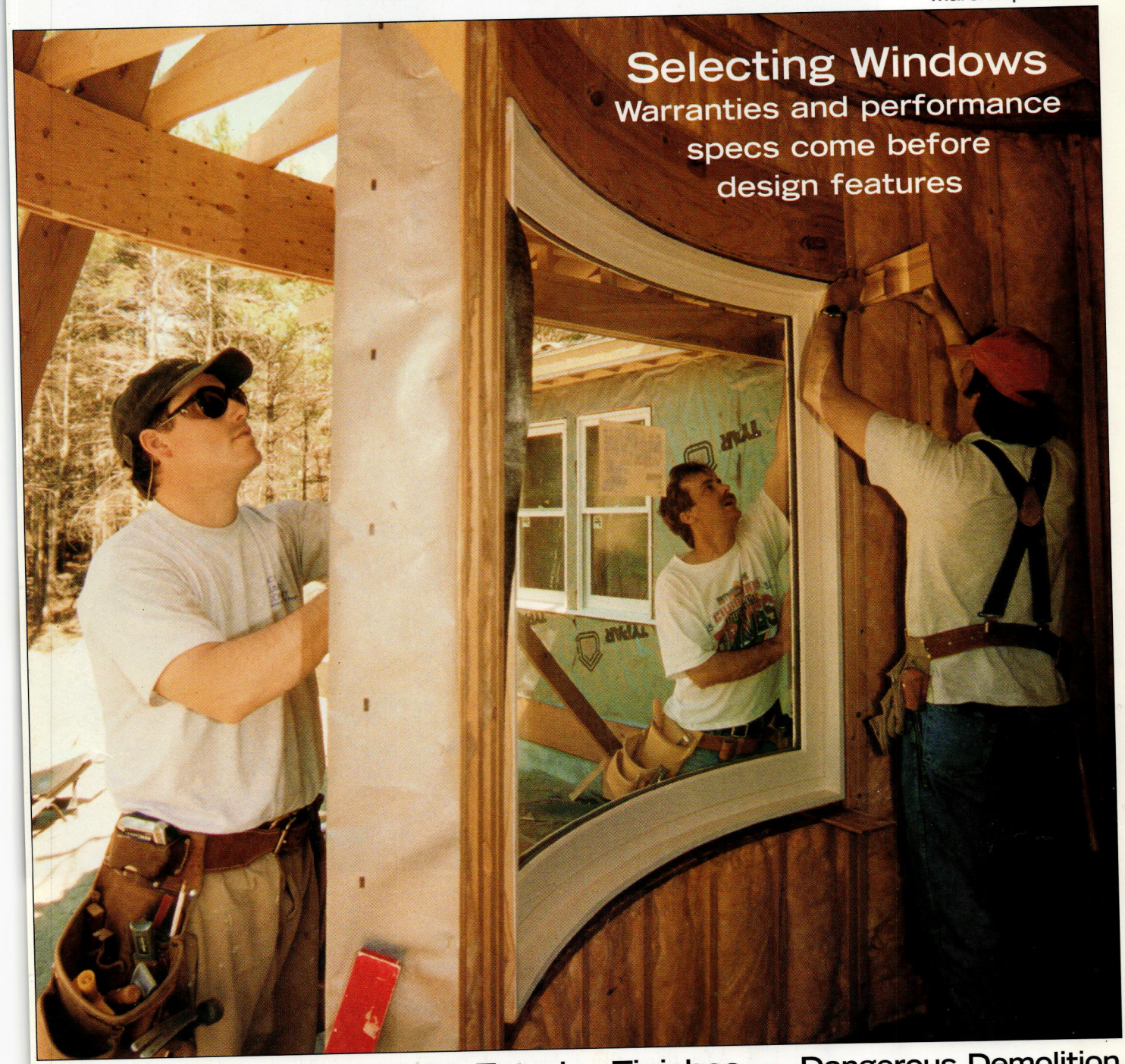
Coastal Contractor

hanley wood

March/April 2006



Selecting Windows

Warranties and performance specs come before design features

CAROLYN BATES

Rebuilding the Gulf ~ Clear Exterior Finishes ~ Dangerous Demolition

Supplement to The Journal of Light Construction and Remodeling Magazine

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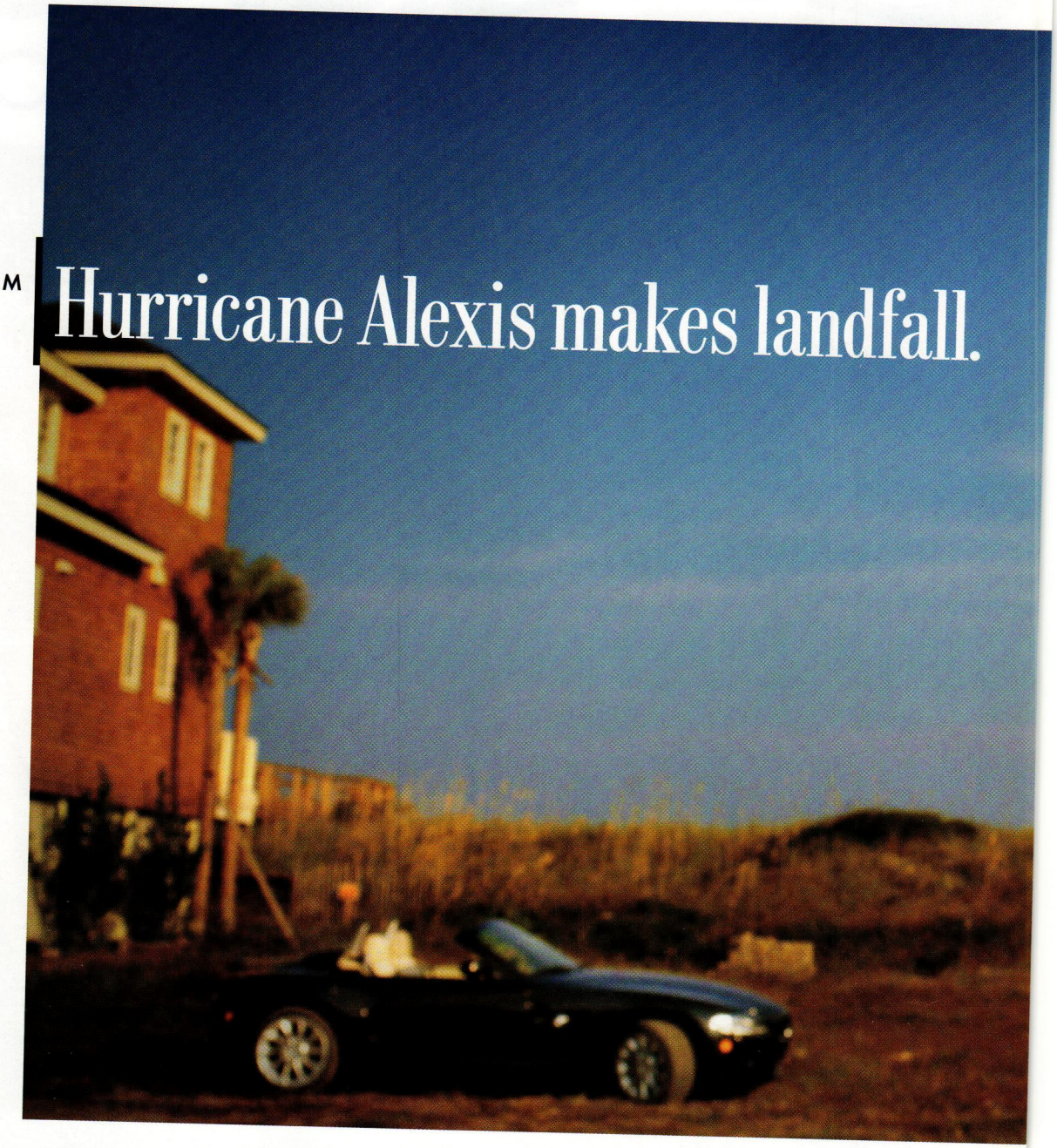
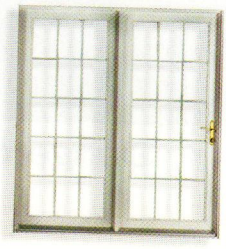
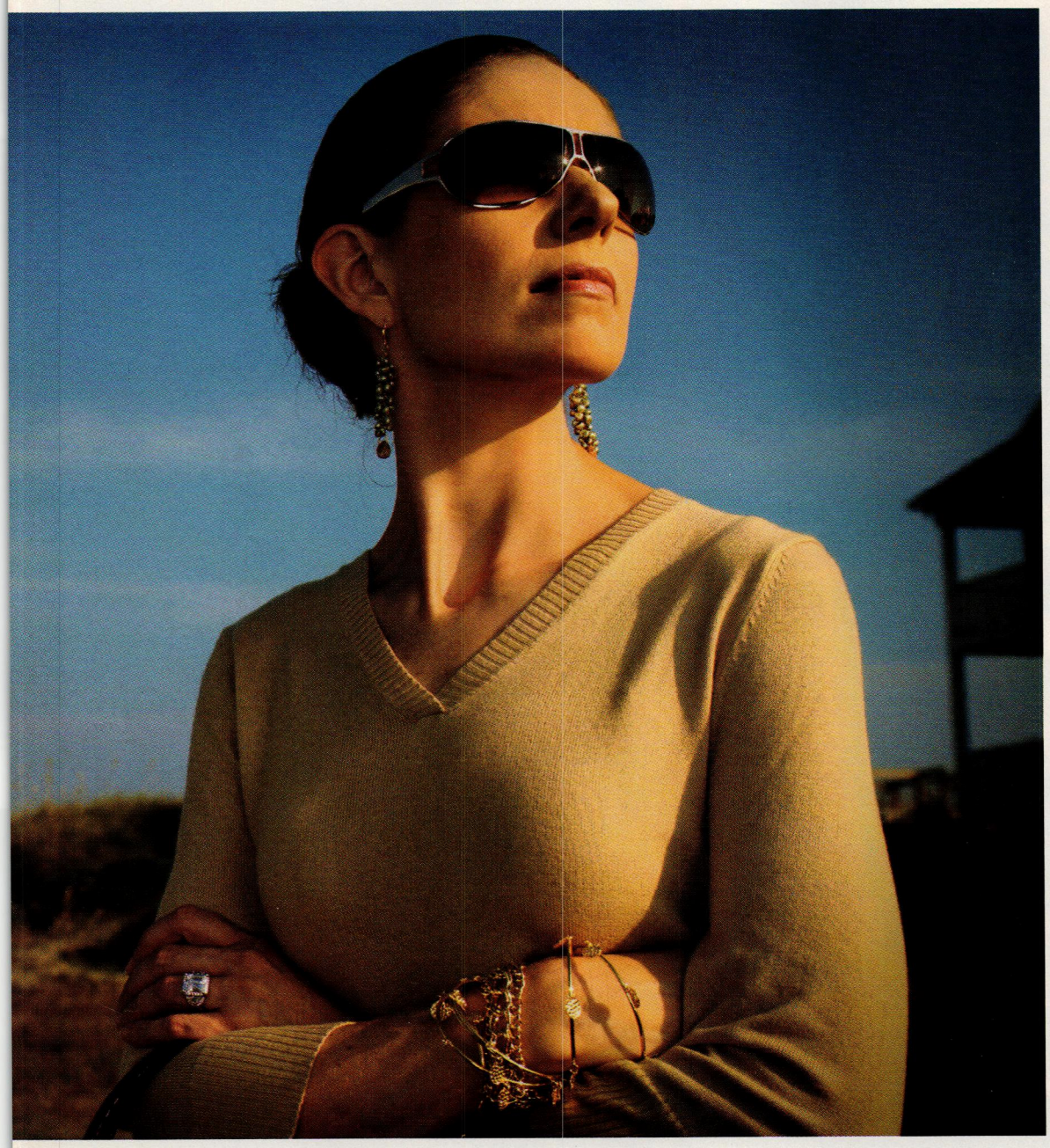
Hurricane Alexis makes landfall.





Here comes Alexis Stanforth—homeowner, perfectionist, woman intent on driving you insane. It seems Alexis has a few things she'd like to discuss with you. A few things that, in her words, "aren't quite right." Fortunately, one of those things isn't the window and door package. Why? Because you installed Simonton StormBreaker Plus™—the preferred impact windows and doors in thousands of



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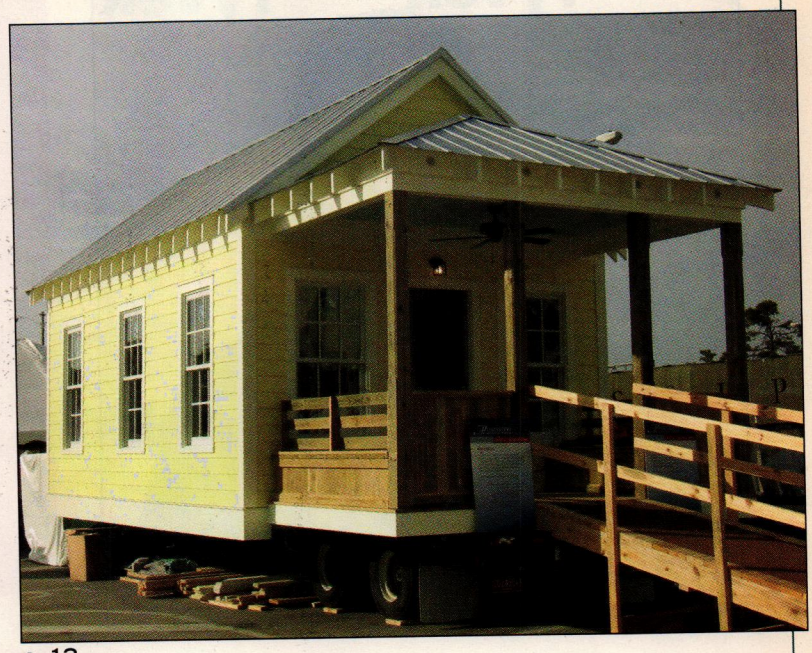

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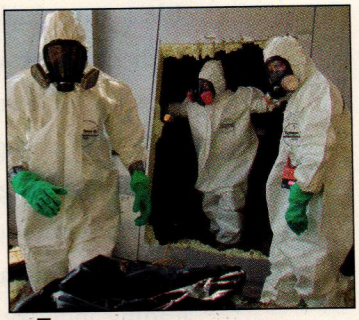

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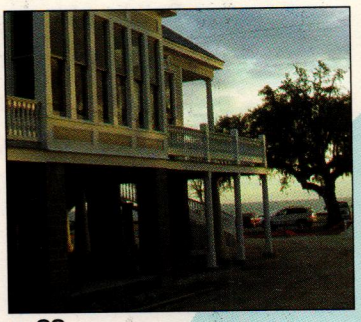

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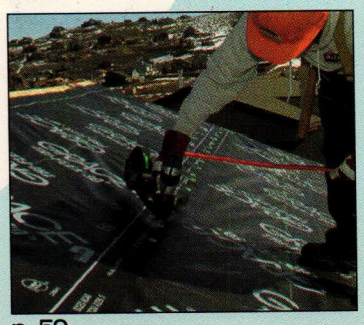

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Terry Fallon Graphic Designer

Contributors Ted Cushman, Aaron Hoover

Theresa Emerson Production Director
Annie Clark Digital Ad Manager
Katina Billado Ad Traffic Manager
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Editorial Offices:
186 Allen Brook Lane
Williston, VT 05495
(802) 879-3335 Fax: (802) 879-9384
Advertising Offices:
One Thomas Circle, N.W.
Suite 600, Washington, D.C. 20005-5811
(202) 452-0800 Fax: (202) 785-1974

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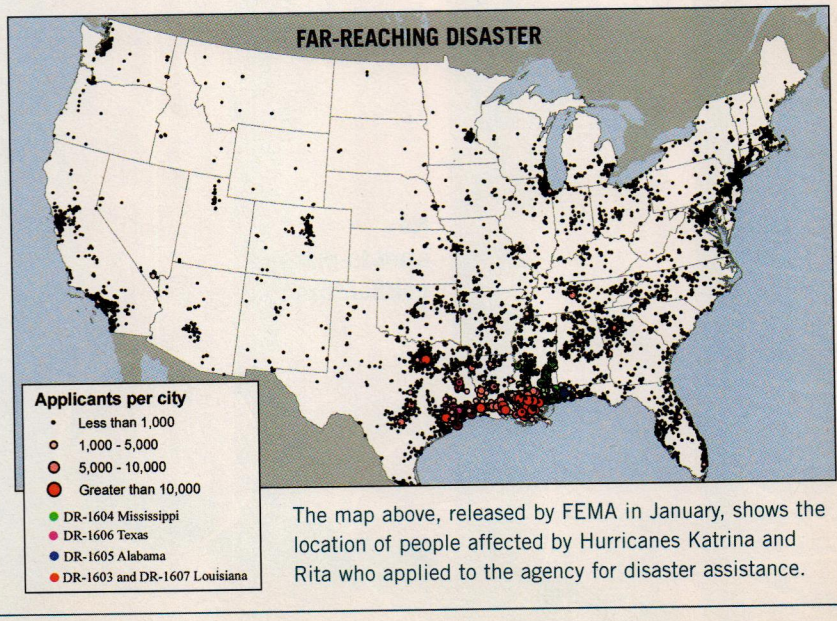
Gulf Fixation

Six months ago, Hurricane Katrina had just crossed the tip of Florida and nicked Alabama before plowing head-on into Mississippi and Louisiana. Just six months ago — a short time, relatively, but for those directly affected, it must feel like a time without end.

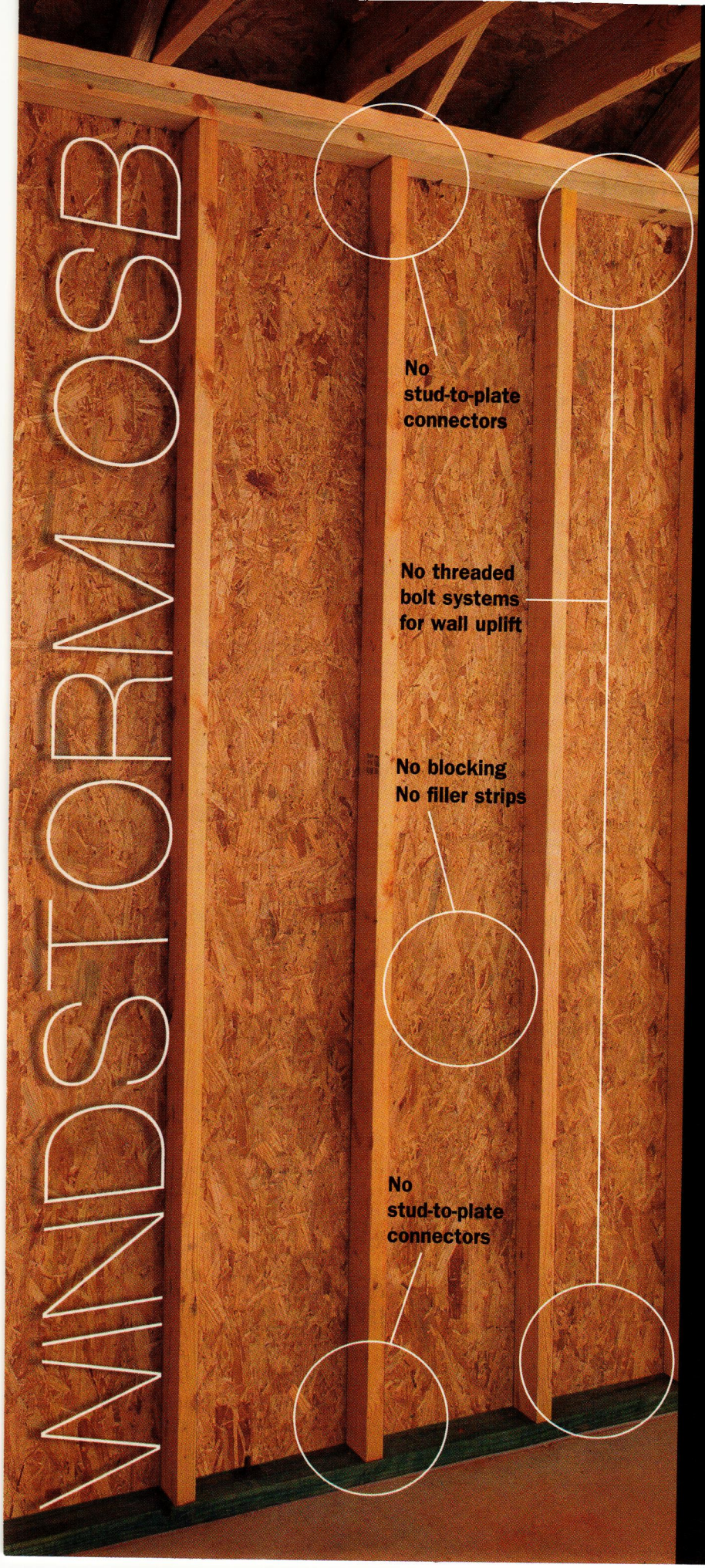
The National Hurricane Center (NHC) reported in late December that "the scope of human suffering inflicted by Hurricane Katrina in the United States has been greater than that of any hurricane to strike this country in several generations." As of late December, some 1,336 individuals had died from causes attributable to the storm, while more than 4,000 people were still reported missing. Thousands of homes and businesses comprising entire neighborhoods were destroyed by flood in New Orleans, and Katrina's surge struck the Mississippi coastline with such ferocity that entire communities were obliterated. Over half a million homes were damaged in the region. The NHC predicts that many of the most severely impacted communities will take years to rebuild.

Six months later, we are barely into that rebuilding. Only now is much of the information about what happened coming to light. From this, we are just beginning to understand what might — and what must — be done to avoid such losses in the future. With that goal in mind — bringing clarity as to what building practices best protect coastal homes *everywhere* from damage and loss — *Coastal Contractor* will continue to devote coverage to rebuilding the Gulf throughout 2006. In this issue, Ted Cushman initiates our special feature coverage (page 28) with an account of lessons learned that he gathered while lending a hand in the recovery in September. In *Breakline* (page 7), Aaron Hoover covers the risks of working in flooded homes in New Orleans and reports on the Mississippi Renewal Forum's efforts to gather information from local residents to aid in long-term redevelopment. One of the successes coming out of that forum led to key home-design insights, as I report in the *Design* column (page 13).

No one will feel the strain inflicted by these storms as much as the hundreds of thousands of people who have been displaced and whose lives have been so disrupted. But we have all been touched by, and still have a great deal to learn from, this storm's far-reaching effects. — *Clayton DeKorne*



The map above, released by FEMA in January, shows the location of people affected by Hurricanes Katrina and Rita who applied to the agency for disaster assistance.



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Dangerous Demolition

Working in the New Orleans toxic soup

JOHN FLECK/FEMA

After cutting into a cafeteria meat locker, a HazMat team removes rotten meat from an elementary school freezer that lost power during Hurricane Katrina.

As head of a crew tearing out carpet, furnishings, and drywall from New Orleans homes and businesses, Devon Seymour has seen the worst of Katrina's aftermath.

But for Seymour, the dried muck, rampant mold, and other crud he and his three workers encounter aren't as onerous as an invisible scourge: the smell. At one Burger King where boxes of burgers lay rotting in powerless, stifling freezers, it was so bad that he and the others could barely finish the tear-out.

"Even with the respirator, I actually threw up at least one time there," says Seymour, who relocated from Miami to New Orleans after the storm. "We lost a couple of guys easy on that project because the stench was just unbearable."

As the floodwaters from Hurricane Katrina's August landfall seeped out of New Orleans, several organizations raised concerns about toxins, mold, and other hazards left behind. Although the concern centered on returning residents, those engaged in demolition and renovation arguably faced the greatest risk. But as of late December, little was known about the extent of that risk and what sort of health problems it might have already caused or would cause in the future. And what information did exist was frequently the subject of disagreement between environmental and health advocates on one side and federal and state officials on the other.

Meanwhile, the U.S. Occupational Safety and Health Administration, among other agencies, had publicized safety measures for workers in New Orleans. But it is far from clear that contractors or employees know or follow them consistently.

"No one has given us guidelines," says Jack DeGeorge, co-owner of All American Builders and Remodelers. He requires his dozen workers to wear rubber gloves, boots, and respirators when common sense seems to warrant it, but says he thinks any danger is overblown.

Within weeks of the storm, the National Resources Defense Council (NRDC) was warning of a "toxic chaos" in New Orleans either being ignored or minimized by the Environmental Protection Agency (EPA) and Louisiana Department of Environmental Quality (DEQ). The NRDC says its sampling of the sediment left on streets and sidewalks revealed dangerous levels of arsenic as well as carcinogenic hydrocarbons and organic chemicals. By contrast, the EPA and DEQ maintained that — with the notable exception of a St. Bernard Parish neighborhood near the Murphy Oil spill — arsenic and other toxin levels were typical for older cities and similar to those that existed pre-Katrina.

"... If people avoid obvious signs of hazardous material, practice good personal hygiene, and use common sense, exposure to the environment should not cause any long-term health effects," concludes a December 9 press release by a multi-agency task force said to reflect conditions of more than 1,000 outdoor environmental samples.

But indoor toxins — those that workers are more likely than others to repeatedly encounter — may be more problematic. The EPA didn't test indoors, arguing that private homes were not within its jurisdiction. The NRDC did its own limited tests for mold, measuring spore counts in eight homes, including some untouched since the flood and others partially or fully "remediated" with, for example, carpet and drywall removed.

In the untouched and partially remediated homes, the NRDC found average

counts of 650,000 and 350,000 spores per cubic meter, respectively. That's way above the "very high" standard of 50,000 spores per cubic meter as determined by the National Allergy Bureau, says Patrice Simms, a NRDC lawyer. Fully remediated homes, meanwhile, had counts of at least 60,000, also high but comparable to outside air in New Orleans, Simms says. But as bad as the numbers sound, "there is no regulatory framework for mold, so there are no standards per se," Simms explains.

He adds that although the NRDC didn't test sediment in homes, toxins in outdoor sediment would also be present indoors. "Anybody involved with the remediation of these buildings is going to be coming into contact with those toxins," Simms notes.

With thousands of workers doing demolition and reconstruction since October, it might seem that toxin- or mold-induced health problems would already be obvious. But despite reports of a ubiquitous "Katrina cough" among both workers and residents, authorities have yet to tally the most common injuries sustained by construction workers, much less any pattern of sicknesses or health problems.

"We do not have numbers on the respiratory tract irritation," says Louisiana state epidemiologist Raoult Ratard in a brief e-mail. "It is all mixed with people who have colds and other respiratory infections."

Seymour, DeGeorge, and others involved with the cleanup on a daily basis seem to report only minor problems. "The ones who had the Katrina cough had that cleared up by antibiotics," says Dennis Roubion, president of Roubion Construction, a New Orleans–based firm of about 50 workers.

Roubion adds that he had just paid his annual workers' comp bill — and that the amount didn't differ from last year's prestorm bill. — *Aaron Hoover*

Gulf Renaissance

A vision to pull devastated coastal towns out of the current dark age

The Great Chicago Fire of 1871 destroyed a third of the city, but the disaster literally cleared the way for the wide boulevards, parks, and skyscrapers Chicago is known for today.

Mississippi officials hope for a similar transformation of 120 miles of shoreline left in tatters by Hurricane Katrina. Just as adherents of an architectural movement called the City Beautiful remade the windy city, Mississippi's planners are turning to one called New Urbanism. They've recruited the movement's father, Miami architect Andrés Duany, to spearhead an extensive statewide planning effort for reconstruction of 11 coastal cities damaged by Katrina.

Bright optimism. New Urbanism, which emphasizes pedestrian-friendly neighborhoods with mixed living and retail space, shuns sprawl and big-box strips. For Duany, Katrina's aftermath presents an opportunity to realize the vision on an otherwise unthinkable regional scale. Says Duany of the cities, "There's a tendency for the ones that are less destroyed to be more optimistic, and I think it should be the reverse. Those that are most destroyed should be most hopeful."

The task, of course, will not be easy. For starters, there's no regional consensus on the New Urbanism approach, much less the particulars — despite, or perhaps because of, an extensive effort by the group pushing it, the Governor's Commission on Recovery, Rebuilding, and Renewal. Last fall in Biloxi, the commission held a six-day meeting, the Mississippi Renewal Forum, to iron out the main ideas. With major support from the Congress for the New Urbanism, well over 100 planners, architects, and designers attended. Specialists later fanned out to work with residents to craft city-specific plans.

Gulfport City Council President Barbara Nalley loves the results. With a prestorm population of 71,000, the largest of Mississippi's Gulf Coast cities reported damage to at least 80% of its commercial and residential buildings. Nalley likes, for example, the commission's proposed extension of Gulfport downtown to the harbor area south of Interstate 90, including a "seaside promenade worthy of Monte Carlo."

"We were going to revitalize our harbor and port area anyway before the storm," she says. "What they've presented to us are even better ideas than what we had in mind."

Some skepticism. Others aren't as swept away. Richard Notter, an alderman on the Long Beach board, says he likes some specifics of the plan but is wary of its approach. "They talk about walkable areas, and that's wonderful in the Northeast," he says, "but in the South it's very, very hot and people don't want to walk around outside."

New Urbanism, modeled after the downtowns of yesteryear, is often identified with historic architectural styles. To evangelize the look, the commission put

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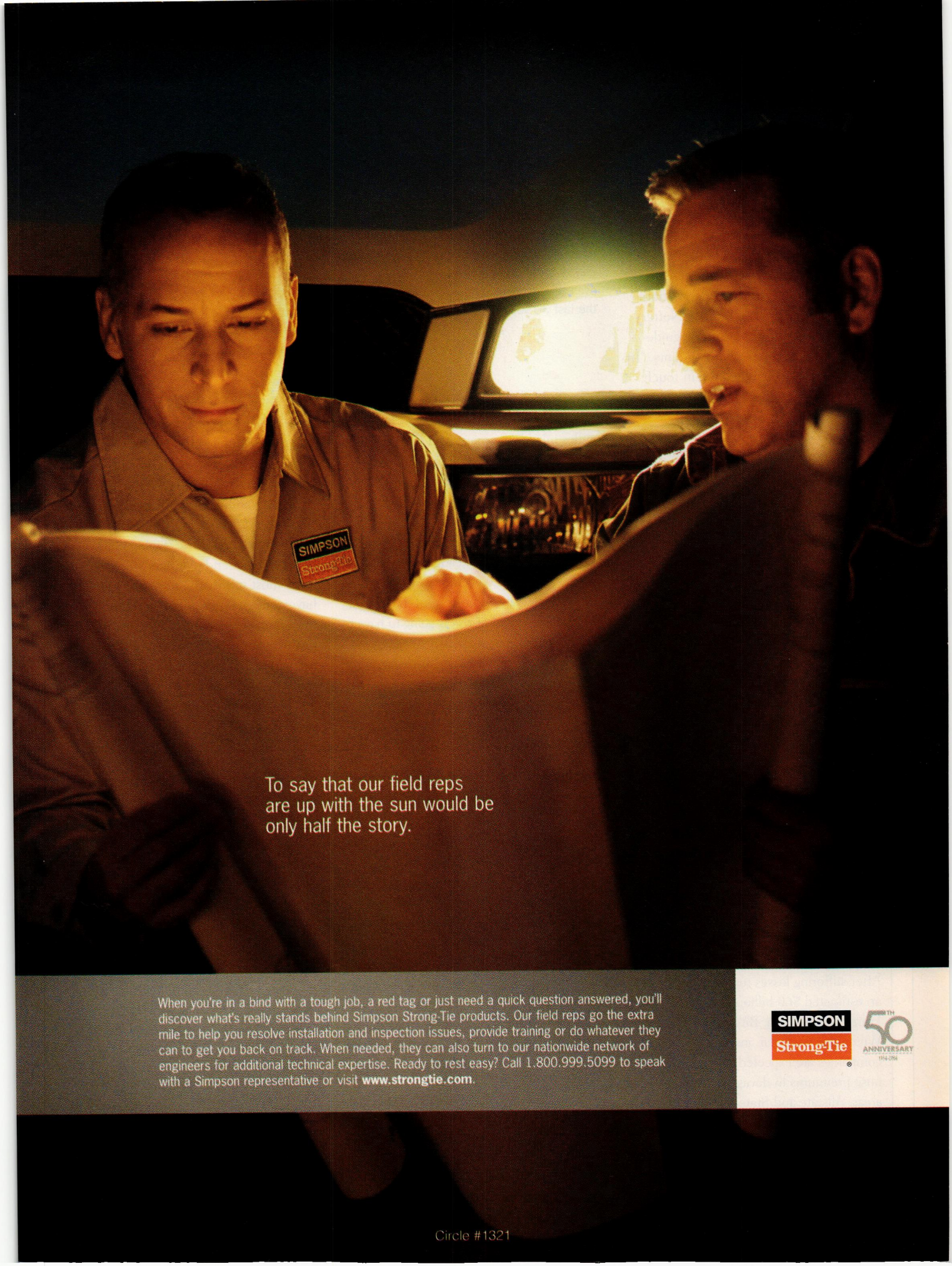

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continued from page 8

together *A Pattern Book for Gulf Coast Neighborhoods*. The book gives advice on how, facing the chore of rebuilding nearly 70,000 destroyed homes statewide, homeowners can recreate their new homes in Mississippi's traditional architectural styles. But Notter has no plans to force aesthetic guidelines on his devastated constituents. "In the South, we're really more in touch with property rights," he says.

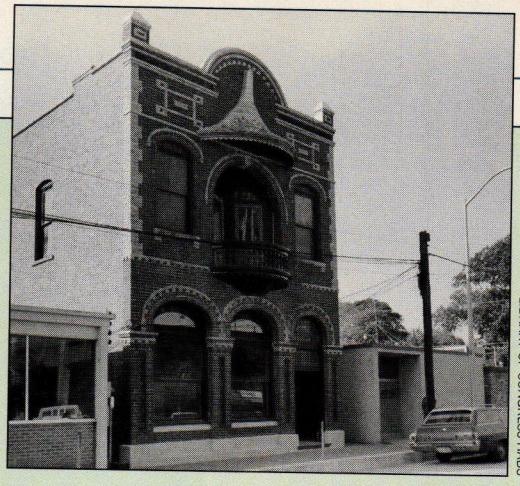
Or as Pass Christian native Billy Bourdin, 77, the second-generation owner of Bourdin Brothers Plumbing and Heating, puts it, "I think they ought to let us go back and do what the hell we want."

Looming forces. Ultimately, the question of whether the New Urbanism plans become a reality will probably depend on how they stack up with other major forces shaping the reconstruction. Looming large are new Federal Emergency Management Agency (FEMA) advisory flood maps for all three of Mississippi's coastal counties. The maps comprise the largest proposed expansion of flood zones in the National Flood Insurance Program's 37-year history, says Todd Davison, FEMA's regional manager for mitigation. Extending as far as 22 miles inland, the maps could prompt thousands of residents either to rebuild formerly ground-level homes on pilings or further elevate homes already in the air before Katrina.

Davison notes that the maps — which different cities have already moved to reject, approve, or modify — and New Urbanism are not mutually exclusive. But, he says, "I think the element of risk is going to have to define land-use regulations."

Numerous other major forces stand to influence the reconstruction as well. One widely endorsed governor's commission proposal suggests moving the east-west CSX Transportation railroad north so that it no longer bisects coastal communities. But as CSX repaired bridges and crossings, there was no sign that was going to happen. "They still own the tracks, and they are planning to run trains down those tracks," says Notter.

Duany is pragmatic, saying many of the architects and planners who count as its most influential supporters already have enough on their hands rebuilding their homes and cities. Some communities will run with the plans; others won't, he predicts. "There are hundreds of thousands of buildings down," he says. "And the very best people are very busy. So yeah, it's going to be difficult." — *A.H.*



LIBRARY OF CONGRESS HABS

By reaching back to the rich architectural heritage of the devastated Gulf Coast, architect and community planner Andrés Duany hopes to avoid reconstructing what he claims to be unexceptional, even tawdry, development of the last 30 years.

Currents

INSURANCE RATES TO CLIMB

After suffering losses totaling an estimated $60 billion due to Hurricanes Katrina, Rita, and Wilma this past year, insurance companies are expected to raise premiums in devastated areas. Allstate and State Farm have already won approvals for home insurance rate increases in Florida averaging roughly 9%. These average rate increases mean that some homeowners may see premium hikes of more than 40%, according to November reports in the *Insurance Journal*. Allstate is now in arbitration seeking an even higher increase of 18% in Florida and has indicated it would seek rate increases in other states devastated by last year's storms. Insurance analysts say the rate increases follow not so much from the cost of claims as from the rising cost of reinsurance (the insurance for insurance companies). Last year, reinsurance infused more than $20 billion in capital for U.S. insurance companies to use for handling the claims. This money may have actually put the property-casualty industry as a whole in the black for 2005, despite its heavy losses. But, according to reports in *CNN/Money*, analysts admit that insurers have a "psychological advantage" that favors raising premium pricing.

IT'S NOT OVER 'TIL IT'S OVER

Finishing off one of the most active hurricane seasons in history, Tropical Storm Zeta — the 27th major storm for the year — formed in the eastern Atlantic in late December. Zeta is the sixth letter of the Greek alphabet, which has been used to identify storms since forecasters ran out of names on this year's official list of 21. The number of names selected for the storms for this past year was based on the most active previous year, 1933, when there were 21 storms. The year 2005 marks the first time there have been more than 21 named storms in 154 years of record-keeping.

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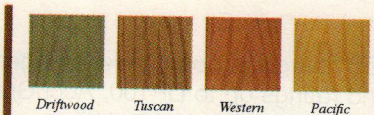

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Circle #1302

Small Is Beautiful

Emergency housing teaches a lesson in home design

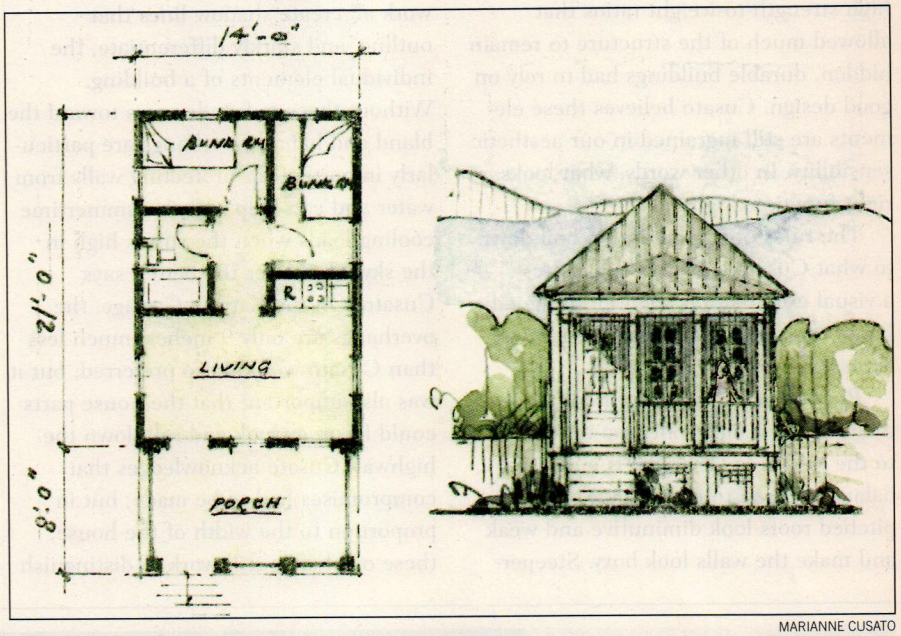
by Clayton DeKorne

"Architecture is a language," explains architect Marianne Cusato. "We all know the vocabulary — windows, doors, walls, roofs — but we don't all know the grammar."

Cusato, who participated in the Mississippi Renewal Forum led by Andrés Duany (see "Gulf Renaissance," *Breakline*, page 8), has articulated a traditional grammar of design for the Katrina Cottage, a 308-square-foot home that made its debut at the International Builders' Show in January. Dubbed the "Tiny House," the show model was stick-built and completely finished in less than 21 days by Jackson, Miss., builder Jason Spellings and his crew. Cusato expects the house to be mass-produced in a modular-house factory as an alternative to the mobile homes FEMA typically uses for emergency housing that, as we reported in January (see "Systems-Built Solutions," *Breakline*, January/February 2006; available online at www.coastalcontractor.net), often become semipermanent housing fraught with problems.

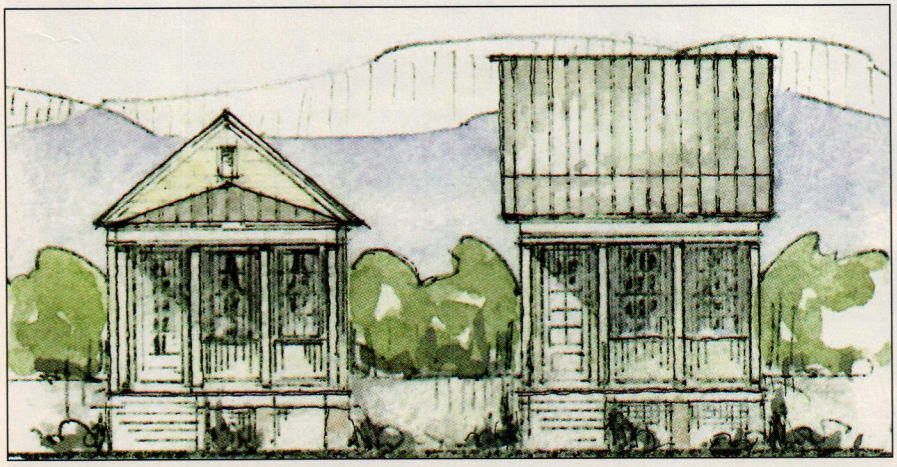
"Physical appearance really matters," argues Cusato. "It might sound absurd to insist on aesthetics for emergency housing. But without some sense of order in the parts that make a house, what is meant to provide shelter runs the risk of becoming its own long-term disaster." Cusato's underlying goal is to create affordable housing that residents can take pride in, rather than build "projects" that become institutionalized ghettos from the outset.

"If we're going to bother to relocate all these people," Cusato reasons, "it makes more sense to provide a place where people are inclined to put out window boxes rather than dump trash out the front door."



MARIANNE CUSATO

The base model of the Katrina Cottage: a 308-square-foot bunkhouse intended as an emergency shelter. Its designer, architect Marianne Cusato, expects this tiny house to be located on the properties of destroyed homes, providing a secure place for residents while they rebuild their old homes. Afterward, it can serve as anything — a home for relatives, a studio, a guesthouse.



The Katrina Cottage is adaptable to a range of exterior treatments. "You can always reskin a cat," notes architect Cusato. She is hopeful the cottage could be fashioned to fit the vernacular of any region, providing a sense of traditional design and instilling lasting appeal in any community faced with a housing disaster.

THE SQUINT TEST

For Cusato, the ABCs of design are grounded in traditional forms that evolved out of practical needs. Before we had sophisticated flashing materials and housewraps, and materials with high strength-to-weight ratios that allowed much of the structure to remain hidden, durable buildings had to rely on good design. Cusato believes these elements are still ingrained in our aesthetic sensibility. In other words, what looks right functions right.

The rules of a good design boil down to what Cusato calls the "squint test" — a visual examination any well-designed home can pass if you squint at it from across the street:

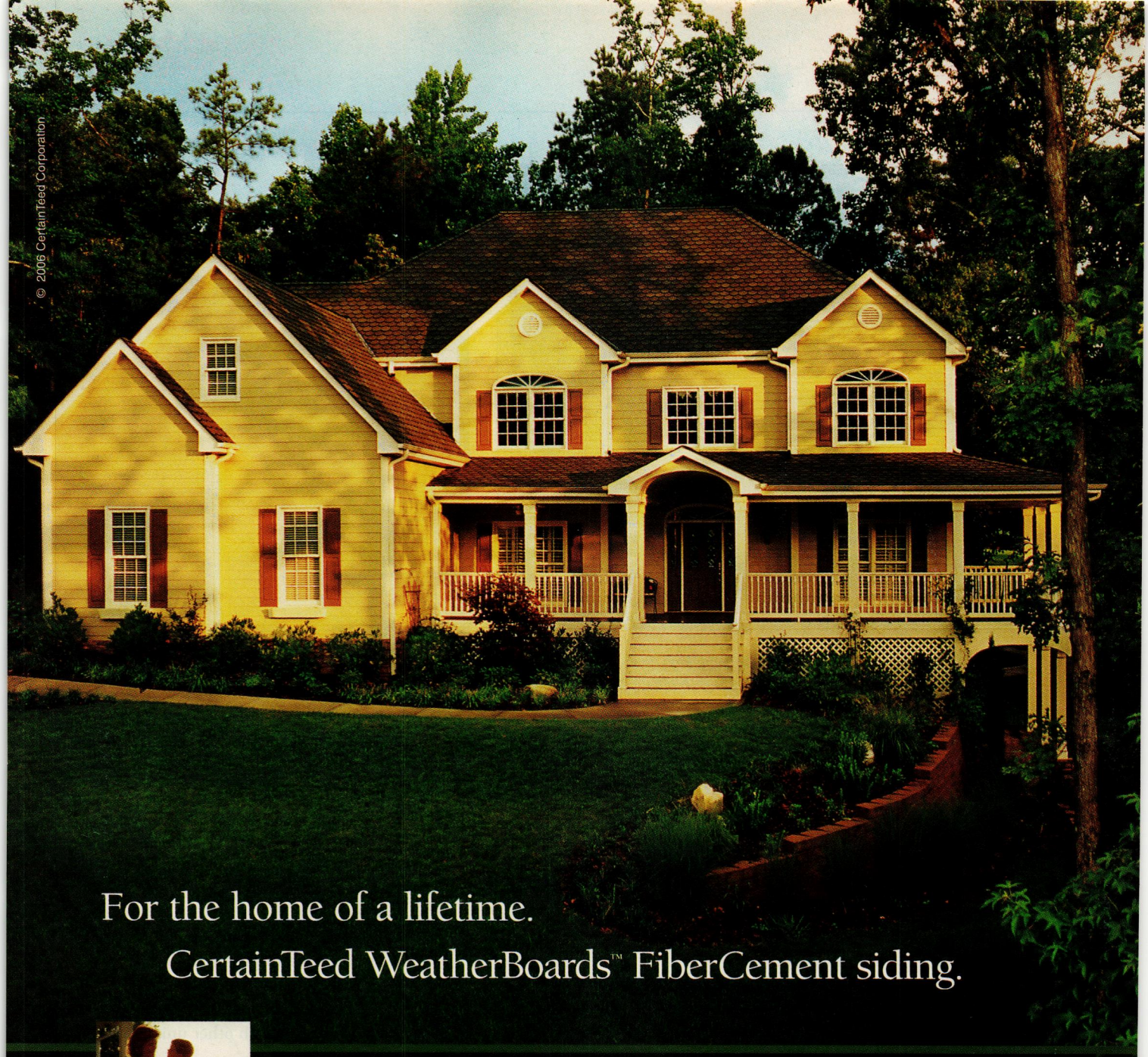
Roof massing refers to the arrangement of the visible roof area in relation to the wall area. The goal is a pleasing balance of wall to roof area. Low-pitched roofs look diminutive and weak and make the walls look boxy. Steeper-pitched roofs create a more balanced proportion of wall to roof area (and drain water much better than a low-pitched roof).

Shadow lines. Overhangs, inset windows and doors, and reveals on woodwork all create shadow lines that outline, and starkly differentiate, the individual elements of a building. Without these, a facade veers toward the bland and banal. Overhangs are particularly important for protecting walls from water and can help reduce summertime cooling loads when the sun is high in the sky. The wider the better, says Cusato. On the Katrina Cottage, the overhangs are only 9 inches, much less than Cusato would have preferred, but it was also important that the house parts could fit on a truck and roll down the highway. Cusato acknowledges that compromises had to be made, but in proportion to the width of the house, these overhangs still work to distinguish the roof area from the wall area below and still provide an adequate drip-edge.

Vertical openings. Keep windows vertical, Cusato urges. Simply put: Vertical openings are more pleasing. We tend to look at things anthropomorphically, she explains, and relate vertical shapes to the human figure.

Cusato believes that narrow windows also evolved for practical reasons: to maximize the amount of daylight without compromising structure. It's easier to span a narrow opening than a wide, horizontal one, so there is an inherent economy of materials in using narrow headers. Narrow openings also make it easier to maintain structural integrity, particularly in regions where high wind loads must be resisted.

Balanced structure. Visible structures should balance. That means posts should be the same width as the beams they carry. A structure with a low center of gravity is sturdier than a top-heavy



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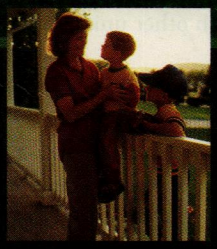

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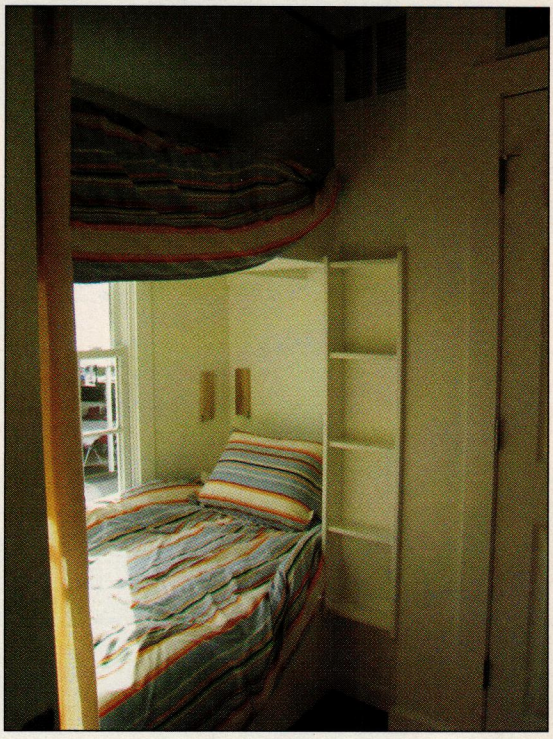
MARIANNE CUSATO



Though the living area is small, it is still quite functional, as these photos of one bunkroom and the main living room illustrate.

structure, and we subconsciously understand this. As Cusato puts it: "We know when a familiar song is out of tune. The same holds true for traditional architecture." Spindly columns may be structurally sound, depending on the material, but will be out of kilter if they appear to support a massive beam. Similarly, if the posts are too massive, appearing much wider than the beam above, the overall look is too imposing. Even dimensions for both provide balance.

Alignments. Windows and doors should align at the same height. Symmetry also helps establish a sense of balance. Evenly spaced divisions created by the openings in the facade and by posts along a beam provide order and regularity that give a sense of balance and security. By contrast, asymmetry, a floating structure, and intentional misalignments to create a dynamic composition can be employed effectively in a building's design, but these are the sort of architectural gymnastics that are unnecessary for the task at hand. Traditional forms, Cusato believes, make it much easier to build the Katrina Cottage quickly with the materials readily available after a disaster.

TASKMASTERS

The design challenge on this project, notes Cusato, was serving three masters at the same time: The project had to be affordable, built quickly, and look nice. "We tend to believe that you can have two of these at a time, but not all three," Cusato explains. "If you want it affordable and fast, it's probably not going to look nice." That's certainly been the assumption for emergency housing, Cusato maintains. But out of the Mississippi Renewal Forum, it became apparent that the Gulf reconstruction effort would require something more. Many people who lost their homes don't have the resources to rebuild immediately. The Katrina Cottage is therefore meant to be moved onto the property and provide a place to live while the destroyed house is being fixed. Afterward, it can remain part of the solution. Beaufort, S.C., architect Eric Moser is developing a series of drawings that will demonstrate how the Katrina Cottage can be adapted, either as an addition to an existing building or ganged with other units, to create a larger home.

BIGGER THAN ONE

Cusato is adamant that the Katrina Cottage is not her creation alone. "It was developed by the largest architectural firm in the country — the collection of architects Andrés Duany brought together to solve the Gulf Coast crisis. We all put our heads together and listened to the concerns of people who lost everything to Katrina. This is just one response, and it's much bigger than I am." — *Clayton DeKorne is editor of* Coastal Contractor.

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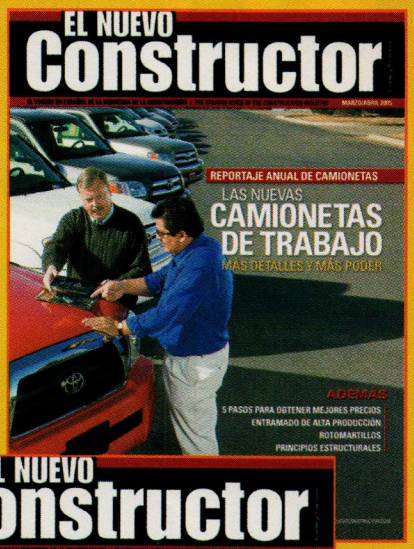

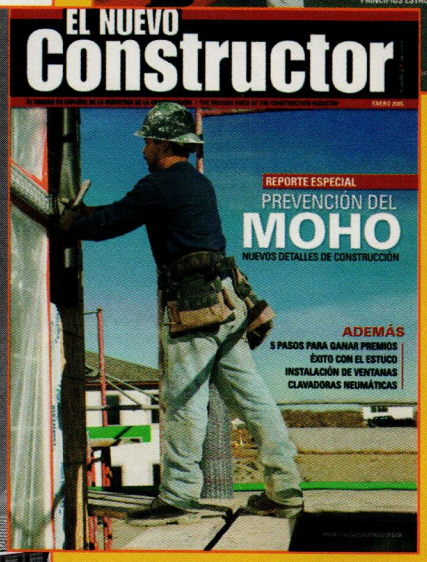

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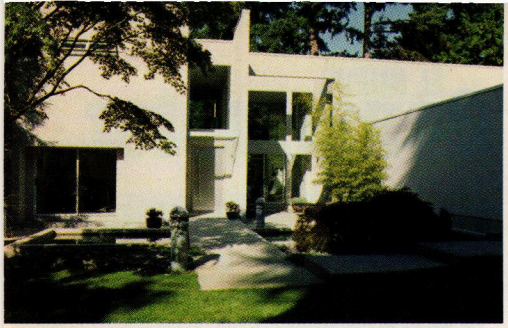

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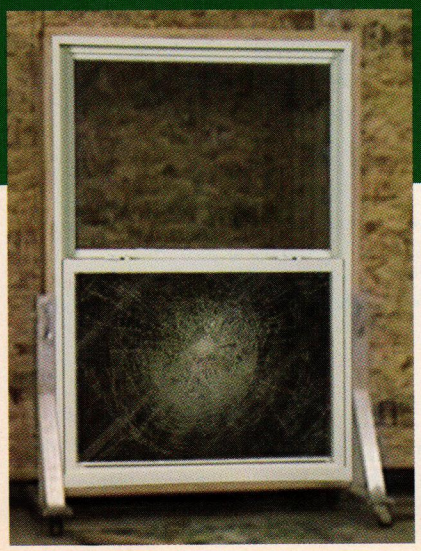

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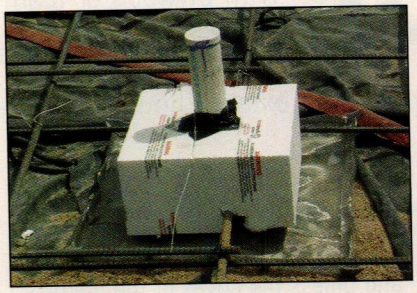
Termite Defenses for Slab-on-Grade Foundations

Q: We've been told that it's a good idea to insulate the perimeter of slab-on-grade foundations, but we are concerned with termites in our area. What is the best way to detail the foundation to keep termites out?



TERMIMESH

For slab-on-grade foundations, Termimesh provides a barrier around plumbing penetrations. When concrete cures, it may shrink back from the pipe, allowing a tiny gap for termites to squeeze through. The stainless-steel mesh can be secured to plumbing with stainless-steel clamps (top) or installed beneath a foam blockout (bottom).

A: Exterior foam on any foundation presents a real problem wherever termites are active. Termites tunnel right through the foam, making it nearly impossible to inspect the perimeter of the building for their passageways into the home. A 1/32-inch gap is all a termite needs to squeeze through to get inside a home, which makes it very difficult to detail any type of foundation to keep these insects out. Slabs are the hardest of all. While a monolithic slab will be the best design alternative for a slab because it will eliminate some of the gaps between the slab and a stem wall, termites can burrow beneath the slab and come up through the gaps around plumbing chases and electrical conduit.

TREATMENTS AND BARRIERS

The most common protection for slabs typically involves soil treatments for the soil beneath the slab and the soil around the perimeter of the building. However, these treatments must be maintained on a regular basis, creating a long-term maintenance issue for the homeowner. Alternatives include borate treatments that target all the structural wood above the slab to rob termites of potential food supplies. These methods, which usually involve either buying pretreated framing lumber or spraying all the lumber prior to framing, have proved to be most effective against the Formosan termite, which may nest aboveground (see "Keeping Termites at Bay," Summer 2005; available online at www.coastalcontractor.net).

The most promising termite protection available today is the Termimesh System, which is the only system available that actually blocks the entry of termites into the home. Developed in Australia and tested by U.S. Dept. of Agriculture Forest Service in Gulfport, Miss., for over a decade, Termimesh consists of a stainless-steel screen that is installed at the perimeter of the slab and at interior entry points through the slab.

At the slab's perimeter, Termimesh is bonded using a cementitious bonding agent that's painted over the mesh to seal the screen to the concrete. This will not completely prevent termites from entering a building through hidden gaps, since the insects can still build a passageway around the barrier. But like conventional metal shields that are installed correctly, the screen shield will force termites out into the open areas where their activity can be detected. However, Termimesh offers a critical control that metal shields can't provide: It seals the tiny gaps around plumbing and conduit penetrations. The fine stainless-steel screen is sealed to pipes with stainless-steel clamps or laid beneath plumbing blockouts, then embedded in concrete about halfway through the slab section (see photos, above).

continued on page 22

Got a question?

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Making Sense of Air Barriers

Q: With plywood or foam sheathing on the wall exterior and a properly installed poly vapor barrier on the interior, is an exterior housewrap needed as an air barrier?

A: Unless all the seams in the poly vapor barrier are taped or caulked and unless the edges of the membrane are adhered to window and door jambs (the units, not the rough opening) and to all electrical and plumbing penetrations, an interior vapor barrier will not function as an air barrier.

VAPOR-DRIVE DYNAMICS

Poly vapor barriers were developed to stop moisture migration by diffusion, which is the least significant moisture transfer method in a home. Interior vapor barriers are typically only needed in northern climates, where air conditioning is not used and where indoor relative humidity can be very high compared with the dry, cold outside air. The extreme difference between indoor and outdoor humidity levels creates a strong vapor drive that, without a vapor barrier, can drive indoor humidity into walls, where it's likely to condense on cold surfaces near the exterior, leading to moisture problems inside the walls. Where air conditioning is used, however, the vapor drive is likely to move in the opposite direction — from the hot, humid outside to the cooled-down inside. When the outdoor humidity hits an interior vapor barrier, it will be blocked, condense into liquid water, and create a moisture problem inside the wall. Therefore, interior vapor barriers are not recommended wherever air conditioning is used.

WEATHER-BARRIER TREATMENTS

Air barriers are a completely different animal and a much more significant player in any home — and doubly so for coastal homes in breezy, humid settings. For starters, air moves moisture through building cavities at a much greater rate than diffusion, making air-sealing a much more important strategy for building a problem-free energy-efficient home. Most exterior air barriers, whether asphalt felt or plastic housewrap, are better thought of as *weather* barriers, because they serve two functions: First, they seal against water penetration, and second, they help stop air leaks through walls. Their most important function is protecting the wall structure from wind-driven rain that gets past the siding. All building wraps should be lapped shingle-fashion (underlying courses overlapped

STEVE EASLEY ASSOC.

Sealing electrical and plumbing penetrations through interior wall plates will go further to air-seal a home than taping the building wrap, providing the building wrap is lapped.

continued on page 24

continued from page 21

GENERAL DETERRENTS

Because termites primarily search for food by the scent of rotten or decaying wood, it's important to remove potential food sources from the job site to every extent possible and to protect wood on the house from moisture:

- Do not bury stumps and wood debris on site, and keep cutoffs and cardboard scrap out of the backfill.
- Remove wood concrete forms and stakes, and peel back the ends of Sonotube forms from the tops of poured piers.
- Control runoff with gutters and downspouts, backfill with well-draining material, provide good foundation drainage, and control site drainage. These practices will keep soil drier, robbing termites of the high soil moisture content they need for survival.
- Use only pressure-treated wood in contact with the ground.
- Be sure to hold siding and trim at least 8 inches above grade.

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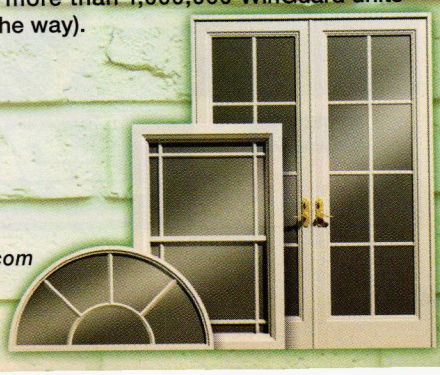

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continued from page 22

by the courses above) and secured with plastic-capped nails.

But building wraps are not the only water barriers a house should have. Building wraps must be integrated with flashing around every opening, including all windows and doors, exterior lighting fixtures, dryer vents, and HVAC air inlets and exhaust outlets. They must also lap over deck ledger flashings, sidewall flashings, window and door cap flashings, and skirtboard caps. Think of the weather barrier as an extension of the roof underlayment that laps over the drip-edge, chimney flashings, and vent boots. It's all done exactly the same way and for exactly the same purpose: to drain water down and away from the building.

Weather barriers act secondarily as air barriers to stop infiltration and exfiltration through wall cavities. Building wraps are the easiest way to air-seal many framing connections that are difficult to seal from the interior. Prime examples include the cracks around headers, rim joists, corners, and wall intersections. But a building wrap, no matter how carefully installed, is *not* the only component of an air barrier. Other vital components include the sill seal between the top of a concrete foundation and sill plates, and the foam sealant between window and door units and their rough openings. And building wraps on the walls do nothing to stop air through the ceiling, which often represents the most significant air loss in a home, carrying energy and moisture away from the interior and into the attic and beyond.

Holes through the lid of the house — through cracks at the top plates of interior partitions, wiring and plumbing holes through interior wall plates and chases, gaps around chimneys and around ceiling lighting fixtures, and leaks in ductwork that runs outside the building envelope — all provide an enormous amount of air leakage that no housewrap can touch. Liberal amounts of foam, dense-pack insulation, duct sealing mastic, plastic drawbands and acrylic duct tape, sealed-canister light fixtures, and plywood barriers (see "Details: Airtight Framing," January/February 2006; available online at www.coastalcontractor.net), plus keeping HVAC systems inside the building envelope, are all key to keeping a house airtight and problem-free.

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When Katrina surged over the Mandeville seawall, two historic homes stood firm

Back to the Future

by Ted Cushman

The storm surge washing over a 6-foot seawall on the north shore of Lake Pontchartrain packed nothing like the destructive punch of the 25-foot wall of water that scoured beaches and obliterated houses on Mississippi's Gulf Coast, a scant 90 miles away. Even so, the Pontchartrain wave took its toll on August 29, 2005. From where I stood just two weeks after the storm, I could see homes and storefronts that had been battered into scrap up and down Mandeville's Lakeshore Drive. By then, light traffic had begun flowing across the causeway past a now-quiet lake. The silence in the nearly deserted neighborhood was interrupted only by the occasional squawk of a utility truck's two-way radio as a lone crew worked to patch in power.

Justine, a plantation home moved to Lakeshore Drive in Mandeville, La., sits on a new 15-foot pier foundation. The renovated home was one of the few lakefront buildings to survive the surge rushing over the seawall when Katrina struck.

LYNN MITCHELL

NO CHIP OFF THE BLOCK

Amid the near-total ruin along Lakeshore Drive, one person worked determinedly in the heat, loading small bits of debris into a wheelbarrow. I mistook Clayton J. ("Chip") Borne III for a worker getting started on rebuilding the neighborhood, but he promptly corrected me: "I'm an attorney. A paranoid, compulsive attorney." And he was happy to report how he insisted on having his house "overbuilt" — as some might have called it *before* the storm.

Unlike the totally wrecked structures on either side, Borne's house — which was originally built in the 1840s — was essentially untouched by the storm's wave, estimated to be more than 10 feet high (**Figure 1**, page 34). He would be able to move back in as soon as crews brought power to the site.

The house, Borne told me, had been renovated just a year earlier: "We took off everything that was sawn lumber and round nails, right down to the hewn beams and square nails." The building was stripped to its original framing, resided, the roof rebuilt and covered with new slate, and — most important in terms of simple survival — the whole house elevated to 17 feet above sea level (see "Flood-Proofing Basics," page 30).

Borne pointed to the mark where the floodwaters had peaked, 18 courses of brick above the slab-on-

FLOOD-PROOFING BASICS

In compliance with requirements laid out by the National Flood Insurance Program (NFIP), all buildings in A and V zones must be built above the Base Flood Elevation (BFE). This means that the structural elements of the lowest floor must be elevated above a height determined by a statistical analysis of the last 100 years of flooding. There is no single A- or V-zone requirement used on a nationwide basis. Instead, each local community adopts its own certification procedures and documents, which comply with minimum NFIP requirements.

WAVE RESISTANCE

Waves exert enormous pressures on buildings. While winds wield pressures in the tens of pounds per square foot, a 2- to 3-foot wave can exert pressures in the hundreds or even thousands of pounds per square foot. A 10-foot wave such as that coming over the Mandeville seawall during Katrina packed several thousand pounds of force per square foot — far higher than any ordinary solid walls could resist. To minimize failure in such an event, the NFIP calls for an open foundation on piles or columns that puts the home above the BFE. This allows the waves to wash harmlessly under the building.

To prevent the foundation from collapsing under the severe lateral force of the wave, no solid structure can enclose the columns; only lattice, screen, or breakaway walls are allowed. In some jurisdictions, even breakaway walls may not be allowed, because they are difficult to monitor after a building is occupied. Owners, anxious to maximize space, often convert enclosed areas into living space by adding wiring, plumbing, countertops, partition walls, and closets — all of which reduce the ability of these walls to break away easily. Instead of breaking free and dissipating the force, the full brunt of the wave is transferred to the columns, increasing the chances that they will buckle.

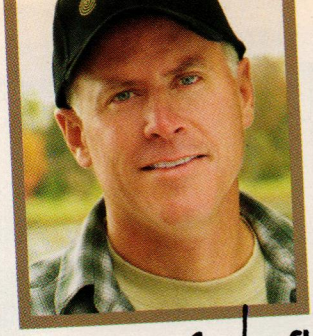
LOAD PATHS

As important as dispersing the force of the waves, the structure above the lowest floor elevation must be designed and constructed to resist flotation, collapse, and lateral movement. Of these forces, lateral movement is perhaps the most likely event because of the extreme wind forces during a hurricane that threaten to push, lift, and overturn the structure. In this case, the primary line of defense is a vertical load path, made with metal connectors to firmly anchor all the structural connections from the foundation columns to the roof.

V-ZONE OPEN FOUNDATION

In V zones, the space between ground level and lowest floor elevation must be free of obstructions, including diagonal bracing, equipment, or other fixed objects that can transfer flood loads to the foundation.

RICK VITULLO



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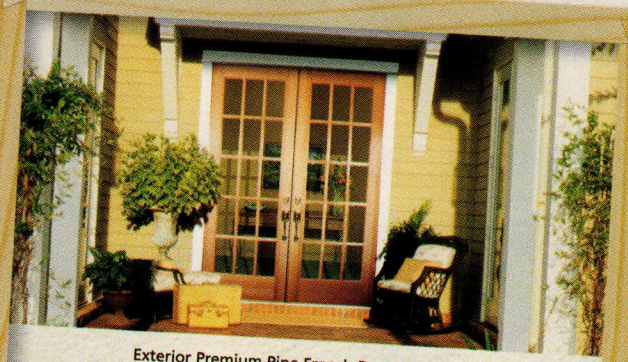

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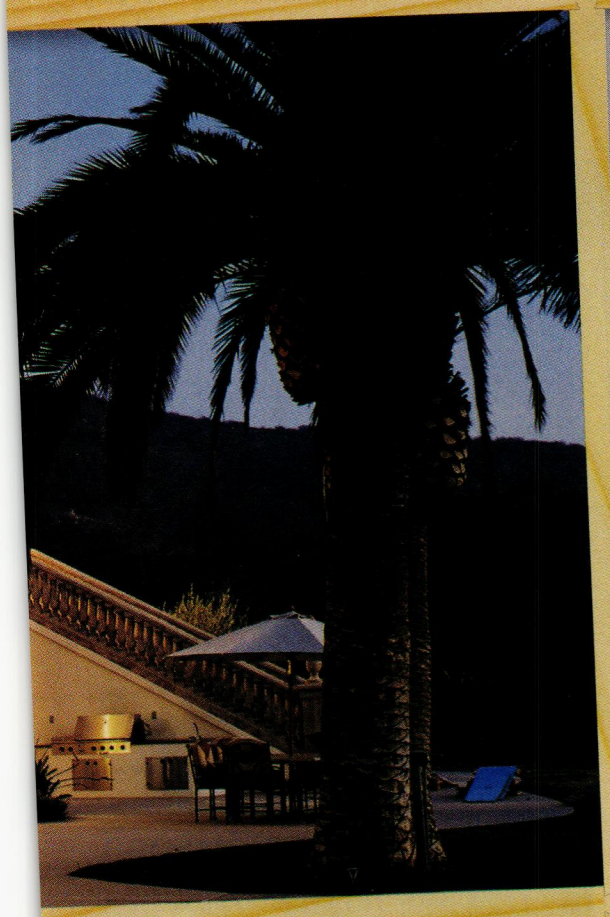

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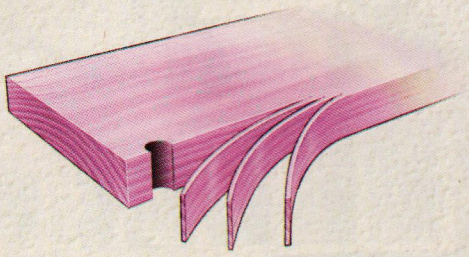

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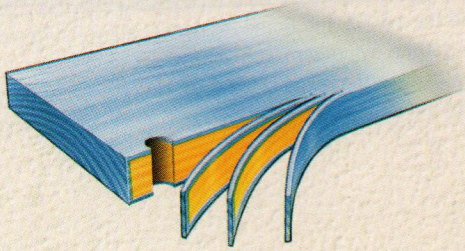

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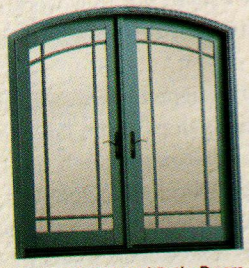
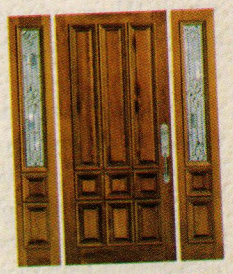


Metal-Clad-Wood Patio Doors



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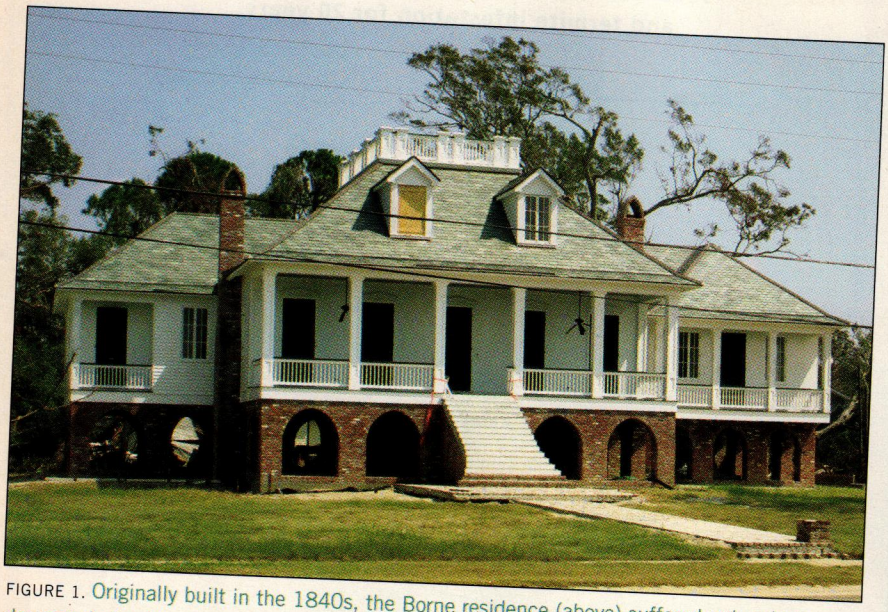
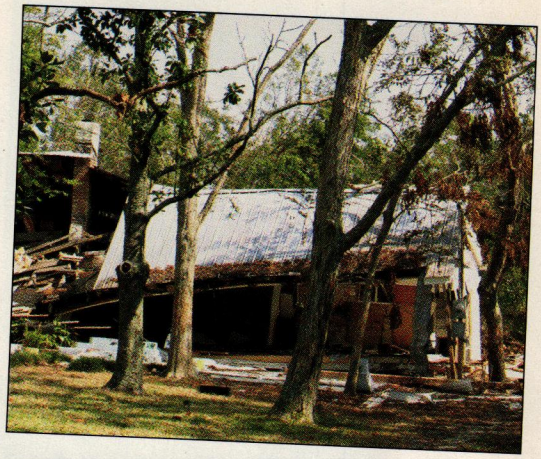




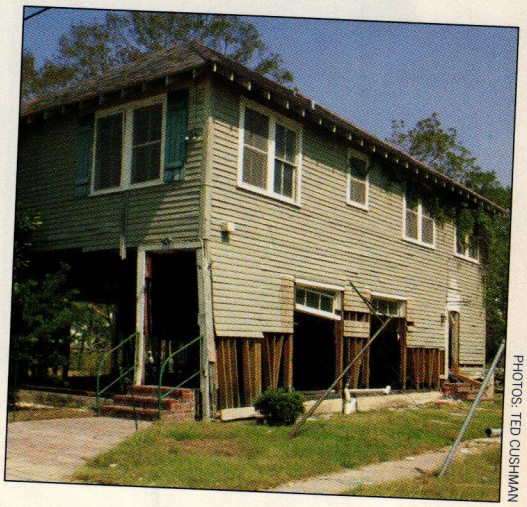


FIGURE 1. Originally built in the 1840s, the Borne residence (above) suffered only minor damage during Hurricane Katrina. Wind damaged an upstairs window, and the surge washed out the stair railings, but otherwise the home stood firm. Unfortunately, homes on either side of it (right, top and bottom) did not fare as well.

PHOTOS: TED CUSHMAN

grade floor under the house. Breakaway wall partitions between the brick arches, lightly pinned with plastic fasteners, had done their job; so had the steel- and concrete-reinforced piers behind the brick facade (**Figure 2**). "I told our mayor, 'These rules y'all have are a pain, but they work!' " Borne exclaimed. "It costs more to do it this way, but it's cost effective."

Architect Lynn Mitchell, who designed the restoration work and an addition on the house's north side, later told me the original 1840s structure didn't need much reinforcing. "It was already pretty rugged," Mitchell explained. Heavy post-and-beam timbers were connected by pegged mortise-and-tenon joints, and the spaces between the posts were filled in with brick, a traditional French Colonial method known as *brique entre poteaux* ("brick between posts").

To lift the building, house movers assembled a steel I-beam frame bolted under the original heavy sills and floor girders. The steel frame stayed in place as part of the new structure, with the I-beams bolted to 5-inch concrete-filled pipe columns set on concrete spread footings. The pipe columns themselves, their feet poured into a new slab floor, were then buried within reinforced-concrete brick-faced open-arch walls. In line with each column, steel hurricane straps were fixed to the original timbers and into the addition walls and new roof framing, creating a continuous bearing path for wind uplift loads.

JUSTINE

A few houses down from the Borne residence sits another recent Lynn Mitchell project, the Justine plantation house (lead photo, page 29). Relocated from its original site on a bayou plantation (**Figure 3**, page 36), this building had been floated to Mandeville on a barge over Lake Pontchartrain (**Figure 4**, page 36) and placed on a new foundation on Lakeshore Drive, where it now holds offices (**Figure 5**, page 38). "That one did even better than Chip Borne's house," Mitchell said. "It wasn't touched. Justine has become the poster child for FEMA around here."

"Actually, it *was* touched," jests Michael O'Brien, the general contractor on the project. "It kissed the ceiling underneath and knocked a couple of ceiling boards out. But yeah, it was basically untouched."

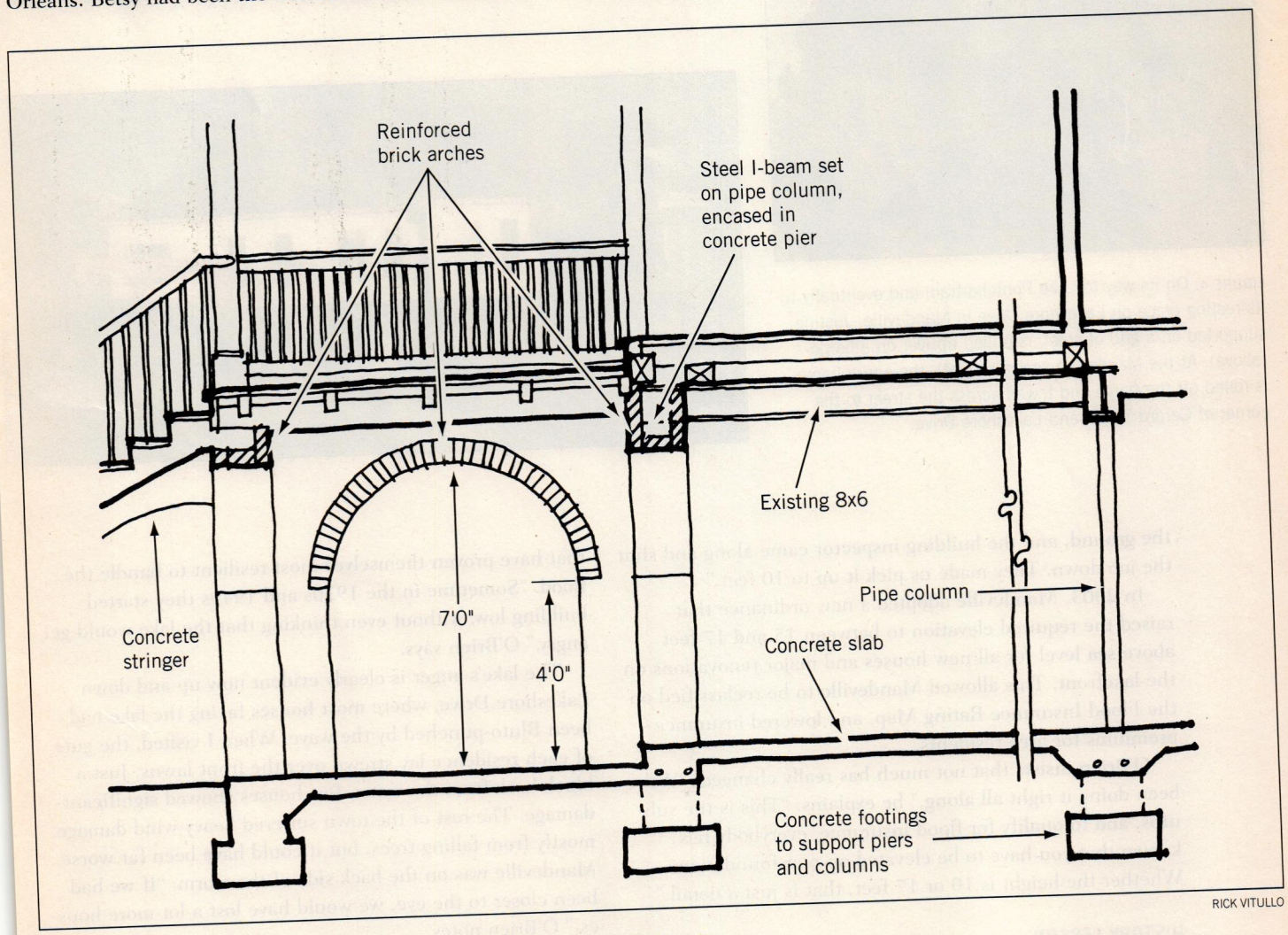
I had caught up with O'Brien by phone, eager to learn what he thought of the latest state rulings: On November 21, 2005, Louisiana lawmakers overwhelmingly approved a

bill mandating a statewide construction code. They did not adopt specific building standards but simply established a code council with the authority to adopt the latest standards recommended by the International Code Council. The state had already adopted the 2003 International Building Code in December 2004. Would the change affect the way O'Brien works, I wondered?

Probably not much. O'Brien pointed out that elevated foundations have been required in St. Tammany Parish, La., since 1978. The area has been on the federal disaster radar since Hurricane Betsy roared through in 1965, bringing its own 10-foot wave that swamped Mandeville as well as New Orleans. Betsy had been the worst flood disaster since the hurricane of 1947 and the first United States hurricane to produce more than $1 billion in damages. Since "Billion-Dollar Betsy," St. Tammany Parish has received 16 Presidential Disaster Declarations, more than any other parish in the state.

Repetitive flooding hazards prompted Mandeville to institute basic flood elevation requirements in 1978 to conform to FEMA's guidelines for storm-resistant construction, in compliance with the National Flood Insurance Program. This meant that anyone wanting flood insurance had to comply with city rules.

"I remember those rules biting me almost 30 years ago," recalls O'Brien. "The clients wanted their house 3 feet off



RICK VITULLO

FIGURE 2. The grid work of steel beams used to lift the Borne house remained in place, posted on steel columns encased in concrete. Initially, the city balked over whether the brick infill arches would provide sufficient clearance for the surge, but eventually allowed them. Katrina affirmed the decision.

FIGURE 3. Originally built on a plantation on Bayou Teche in 1822, Justine was first renovated in the 1840s. In 1965, the house was moved by barge 65 miles south across the bayou to a site near New Iberia, where it is as shown here (at right) just before it was bought in 2001 and then again moved, in 2003, by barge (below), up the canal and over Lake Pontchartrain to Mandeville.

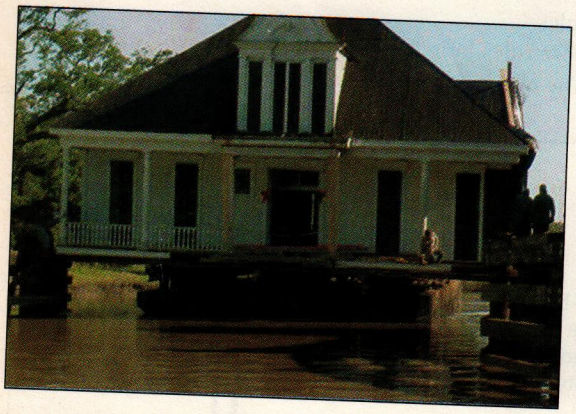


FIGURE 4. On its way to Lake Pontchartrain and eventually to its resting place on Lakeshore Drive in Mandeville, Justine, supported on a grid of steel, is pulled upriver on a barge (above). At the Mandeville seawall (right), the entire home is rolled off the barge and towed across the street to the corner of Gerard Street and Lakeshore Drive.

PHOTOS: LYNN MITCHELL

the ground, and the building inspector came along and shut the job down. They made us pick it up to 10 feet."

In 2003, Mandeville adopted a new ordinance that raised the required elevation to between 15 and 17 feet above sea level for all new houses and major renovations on the lakefront. This allowed Mandeville to be reclassified on the Flood Insurance Rating Map, and lowered insurance premiums for area residents.

O'Brien insists that not much has really changed. "We've been doing it right all along," he explains. "This is the suburbs, and to qualify for flood insurance, everybody has known that you have to be elevated on pier foundations. Whether the height is 10 or 17 feet, that is just a detail."

HISTORY LESSON

The key point, observes O'Brien, is a lesson in history. The old-time builders knew what to do all along, and, indeed, today it's mostly the older historic buildings on the lakefront that have proven themselves most resilient to handle the flood. "Sometime in the 1930s and 1940s they started building low, without even thinking that the lake would get angry," O'Brien says.

The lake's anger is clearly evident now up and down Lakeshore Drive, where most houses facing the lake had been Bluto-punched by the wave. When I visited, the guts of each residence lay strewn over the front lawns. Just a block back from the water, few houses showed significant damage. The rest of the town suffered heavy wind damage, mostly from falling trees, but it could have been far worse. Mandeville was on the back side of the storm: "If we had been closer to the eye, we would have lost a lot more houses," O'Brien notes.

According to O'Brien, present-day requirements for resisting both wind and wave are straightforward: Lift the house and tie it down. "The straps are easy to put on," he urges. "We have nail guns to do that now." But as easy as

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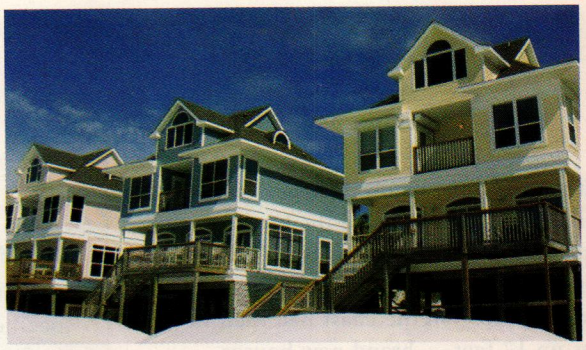

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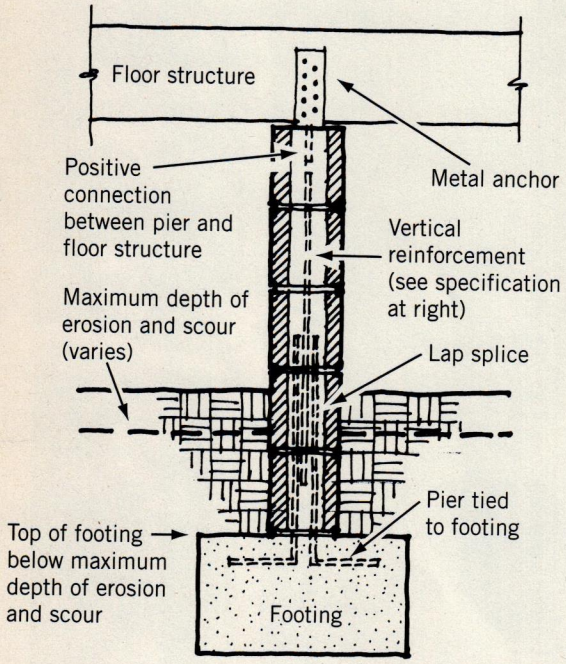


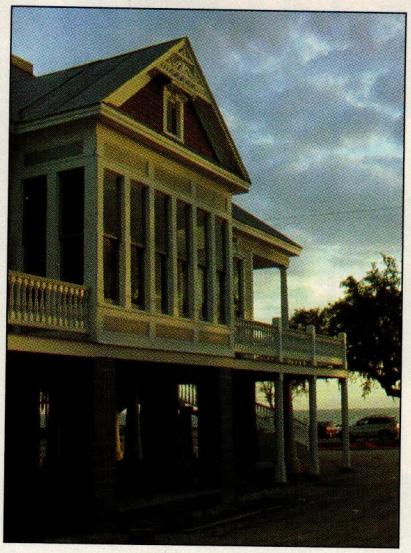
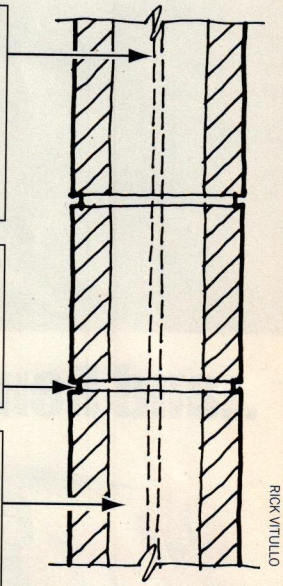


FIGURE 5. Justine now sits on steel piles. The majority of the pilings were encased by concrete masonry units to FEMA specification (left and below), then stuccoed. In front, behind the stairs, tapered columns were constructed of brick and then stuccoed using a 2x4 as a screed and an adjustable metal ring as a template. The finished columns can be seen in the lead photo (page 29).

Reinforcing bars must be protected from salt water to prevent corrosion. Good grout practice will normally protect reinforcing. Galvanized or epoxy-coated bars may enhance pier performance, but holidays and chipped coatings must be increased by 50% for epoxy-coated bars.

Head and bed joints must be well mortared and tooled to prevent water intrusion. Type S mortar for below grade is recommended. Concave joints and V-joints provide the best moisture resistance.

Grout should be in conformance with the reqirements of the IBC 2003. Cleanouts should be placed at the bottom of fully grouted cells to ensure that the grout completely fills the cells from top to bottom.



RICK VITULLO

it might be to comply, O'Brien has few illusions about building the totally storm-proof house. "A 100-foot tree falling on a house — you can't build for that. And some people on the coast had their houses up 17 feet — brand-new houses strapped like crazy. But a 20-foot, 30-foot wall of water came through, and now there is nothing left. The house is just completely gone. You can't build for that, either." ~

Contributing editor Ted Cushman reported this story while traveling to the Gulf Coast to assist in the aftermath of Hurricane Katrina in September.

RESOURCES

FEMA 55. Based on a large and convincing body of data provided during the unusually active 2004 and 2005 hurricane seasons, homes built to the details specified in the *Coastal Construction Manual* (FEMA 55) are capable of surviving the most powerful tropical storms. This lengthy and comprehensive document is available free as a printed report (enough to fill a 4-inch binder) and as an interactive CD-ROM direct from the FEMA Publications Distribution Facility, 800-480-2520.

FEMA 499. FEMA has also produced a series of 31 fact sheets (FEMA 499) that summarize the basic NFIP regulatory requirements and provide information about proper siting of coastal buildings, protecting utilities, detailing connections, and weatherizing the building enclosure (http://www.fema.gov/fima/mat/fema499.shtm).

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Economy windows offer little savings on the coast

In the U.S. market, there are literally thousands of window lines to choose from. Chris Mathis of MCSquared, a building-science consulting firm that focuses on windows, doors, and skylights, underscores this fact by explaining that it doesn't take much to get into the window-manufacturing business and capture local markets with cut-rate pricing. "These are the companies," Mathis cautions, "that may not be around when the glass fails."

Selecting Windows for Coastal Homes

by Clayton DeKorne

WARRANTY FIRST

To pick a window that will last, start with the warranty, Mathis advises. Look for a non-prorated, transferable warranty good for 20 years on the glass and at least 10 years on non-glass parts. These solid warranties are available from most of the bigger window companies, but Mathis says it's surprising how many companies do not offer such a warranty at all, or do not offer it on all their window lines. This reflects a serious compromise in the quality of a large percentage of the windows sold. Nearly 30% of the replacement windows installed today will replace windows that are only seven years old, reports Mathis. "That's a sad commentary on the quality of many windows out there."

Common failures. The most common window failure is the breakdown of the seal on an insulated glass unit. If the seal blows, the window will fog up between the panes, and a lost seal causes a drastic reduction in window R-value. Even if the seal fails gradually, air and moisture slowly entering the windowpane tends to oxidize the low-E coating, turning it into a high-E coating that

PGT INDUSTRIES

All windows, regardless of where they are sold, should carry a good warranty and meet basic structural and thermal performance measures. On the coast, however, high wind loading makes it imperative that windows further meet enhanced structural measures, and the frequent occurrence of wind-driven rain demands giving a second look to test results for water leakage.

absorbs heat rather than reflects it away. This oxidation will look exactly like the salt spray that sticks to the glass, except that it can't be washed off. It looks like a permanent blur between the windowpanes.

While a 20-year glass warranty will adequately cover this most common window failure, a warranty on non-glass parts also becomes especially significant on the coast. Constant humidity, blowing rain, and salt attack will quickly degrade cheap finishes and hardware, and hinder sash movement.

Mathis, a former director of the National Fenestration Rating Council (NFRC) who now serves on the ASHRAE and ASTM code committees as well as on the International Energy Conservation Code Committee of the ICC, urges that choosing a manufacturer that will be around in 10 years to replace deteriorated parts may be the most important window selection criterion of all.

Warranty language. "If a window says 'lifetime warranty,' it makes me nervous," says Mathis. "'Lifetime' is usually written in big, bold letters, but you have to read the fine print to find out what this really means." Many warranties seem to cover a lot up front, but that impression quickly changes when all the details are spelled out.

Language to look for:

- "**Non-prorated**" warranties will cover the entire purchase price of the window for the term of the warranty. Unlike roofing materials, a well-made window shouldn't gradually degrade with exposure, so there is little justification for a prorated warranty.
- "**Fully transferable**" warranties are a sign that the window maker means business. For a homeowner selling a home, it can be a value-added feature that a builder or remodeler can make available when recommending a window.

A 20-year warranty on the glass and a 10-year warranty on non-glass components should be the baseline for any window

- **"Non-glass"** components, particularly hardware, should carry a minimum 10-year warranty. A good window with bad hardware is a bad window, Mathis insists. If a lock breaks or the crank handle strips out, it will reflect poorly on the remodeler who installed the window. Think about the window manufacturer's capacity to stock replacement parts well into the future.
- **Labor and installation.** Unless a certified representative of the manufacturer installed the unit, few warranties will cover the cost of installation. Some may, but for the most part, this will fall to whoever installed the window. This is yet another reason for builders and remodelers to stick with trustworthy brands.
- **Exclusions.** This is key in coastal climates. Some warranties specifically exclude coverage for damage from environmental factors, such as high humidity or salt spray. The exclusion may apply to the glass as well as to the hardware and finishes.
- **Finishes.** Coverage on finishes is rare, but some warranties do cover exterior coatings and finishes on cladding. However, painting or refinishing the exterior to match the home may null this coverage. This is particularly true on aluminum-clad and vinyl units.

Mathis contends that if the warranty passes muster, you are probably dealing with a manufacturer willing to protect its reputation. Behind that reputation will be reliable performance specifications. So, in addition to the warranty, you want to look for an NFRC label that outlines the window's energy performance and an AAMA label that provides third-party assurances of basic structural performance and establishes a norm for air leakage and water penetration.

BASELINE ENERGY SPECS

Much ado is made over low-E coatings — the invisible thin metallic coatings that block radiant heat flow — as well as other energy features, such as gas fills and low conductivity edge spacers. However, builders rarely have the option to choose these à la carte. One useful tool is to compare the performance values for various window configurations available using the Efficient Windows Collaborative's online Window Selection Tool (www.efficientwindows.org). But to make sense of this, you need to understand the baseline measurements of window performance.

Every window worth its salt comes with a label from the NFRC that provides a simple standard for window energy performance (**Figure 1**). Four numbers on this label describe the impact of the entire window unit, not just the glass, on the heating and cooling load of the building. However, only two these — the U-factor and the solar heat gain coefficient (SHGC) — bear close scrutiny.

U-factor is a measure of heat flow (and the inverse of R-value). The lower the U-factor, the less heat will move through the entire window. Mark LaLiberte of Building Knowledge Training Services, a national training and education consultancy that works with many of the nation's top home builders, recommends a U-factor of 0.35 or less, regardless of the climate in which you build. LaLiberte, a team adviser for the Department of Energy's Building America program, acknowledges that this recommendation is more conservative than the Energy Star program, which allows U-factors up to 0.65 in hot climates where radiant solar heat gain is of much greater concern than conductive heat flow (The Energy Star program divides the country into four climate regions and sets prescriptive and performance values for maximum U-value and SHGC. These values can be found at

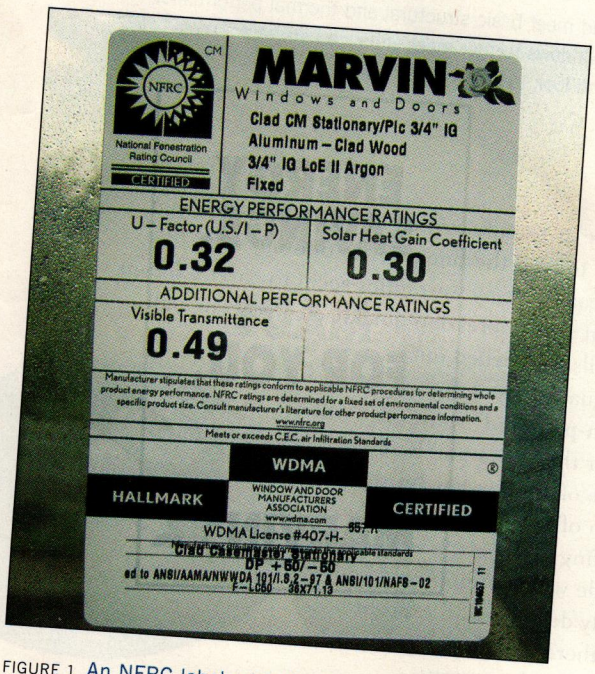

FIGURE 1. An NFRC label rates the basic energy performance of a window using two critical numbers: the U-factor, which measures heat flow, and the solar heat gain coefficient (SHGC), which measures the percentage of radiant heat energy that will pass through the window. For optimal performance in all climates, both numbers should be below 0.35.

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FIGURE 2. Just a couple years ago, windows featuring impact-resistant glass were available in only a limited range of sizes. Now manufacturers competing in the coastal market offer a range of windows with a wide range of design pressures, making compliance with the International Residential Code wind requirements much easier.

www.energystar.gov, then navigating to the Windows, Doors and Skylights energy-efficiency guidelines.)

Solar heat gain coefficient (SHGC) measures the amount of solar heat gain that passes through a window. An SHGC of 0.35 means that 35% of the radiant heat striking the window will pass through the glass, while 65% will be reflected back outdoors. The lower the SHGC, the lower the cooling load on a home will be. Janet McIlvaine, a research analyst at the Florida Solar Energy Center, urges that a "low solar heat gain" window of SHGC 0.35 is best for hot climates. In cooler climates, designers sometimes spec windows with a higher SGHC, wishing to capitalize on solar heat gains. The most common strategy is to design the home with a 2-foot overhang (the widest overhang usually allowed in high-wind regions) to shade the windows from the high summer sun, and select a window with a SHGC above 0.50 to capture solar gains in winter when the sun is low. But LaLiberte, Mathis, and McIlvaine all caution that this strategy should be employed only when the orientation and shading of windows can assure that the windows won't "see" the hot summer sun. Anywhere air conditioning is used during the summer, a low-SHGC window is a safer bet.

Visible-light transmittance (VT) refers to the amount of daylight passing through the entire window area. The heavier the frame and the more divided lights a window has, the lower the VT will be. This number is far more important in commercial buildings, which often use heavily tinted or mirrored glazing that can reduce daylighting possibilities and increase electric lighting costs. For residential windows, McIlvaine advises that the VT rating should be higher than the window's SHGC. That is, there should be more light than heat coming through the glass. But otherwise, it's not a number worth sweating over.

Air leakage (AL) ratings are expressed as an equivalent cubic feet of air passing through a square foot of window area. The lower the AL, the less air will leak through the window assembly. However, this rating is optional, and rarely included on residential windows, even though more energy is usually lost from air infiltration and exfiltration than by conduction or radiation. The justification put forward by some manufacturers for not including this rating is that air leakage between the rough opening and the window unit has the potential to carry away far more than heat than would leak through the unit. The bottom line: Be sure to properly seal the window rough opening with spray foam.

IMPACT-RESISTANT WINDOWS

By now, impact-resistant windows using laminated glass are nothing new to coastal builders and remodelers. Many of the technical difficulties we reported last year ("Specing Windows in High-Wind Zones," Winter 2005; available online at www.coastalcontractor.net) have been worked out, and manufacturers are offering a wider selection of sizes of windows in a much broader range of design pressures (**Figure 2**).

Impact resistance is tested by firing a 2x4 missile at the window and evaluating how well it then holds up to pressure cycling — a test that is intended to simulate the forces of wind-borne debris striking the window during a hurricane (**Figure 3,** page 46). An impact-resistant window typically shatters during an impact test but maintains its integrity if the interlayer and glass shards hold together. While keeping the home and its occupants out of danger, the window will leak significantly.

Opening protection. Installing impact-resistant windows is just one way to meet the structural requirements for wind-blown debris, but it is the most convenient method and, for vacation homes, at least, it may be the most practical (**Figure 4,** page 46). If windows without laminated glass are used, a house must be shuttered during a tropical storm.

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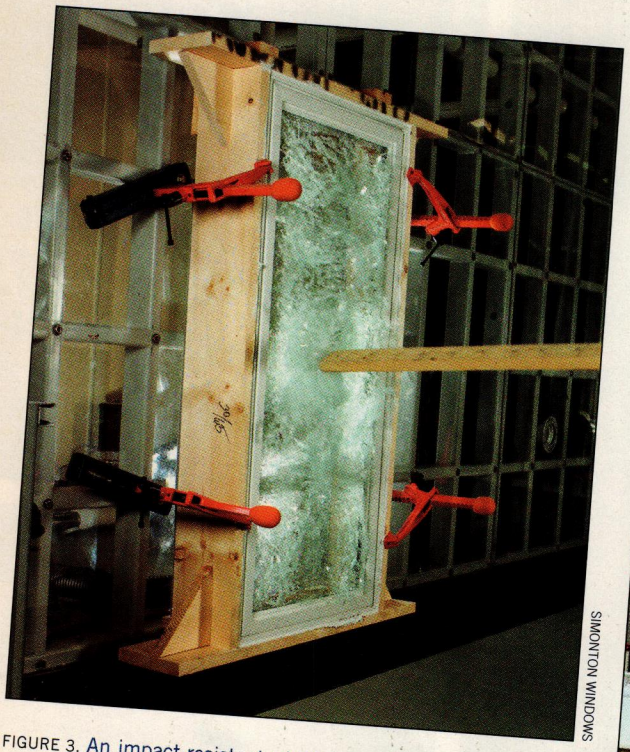
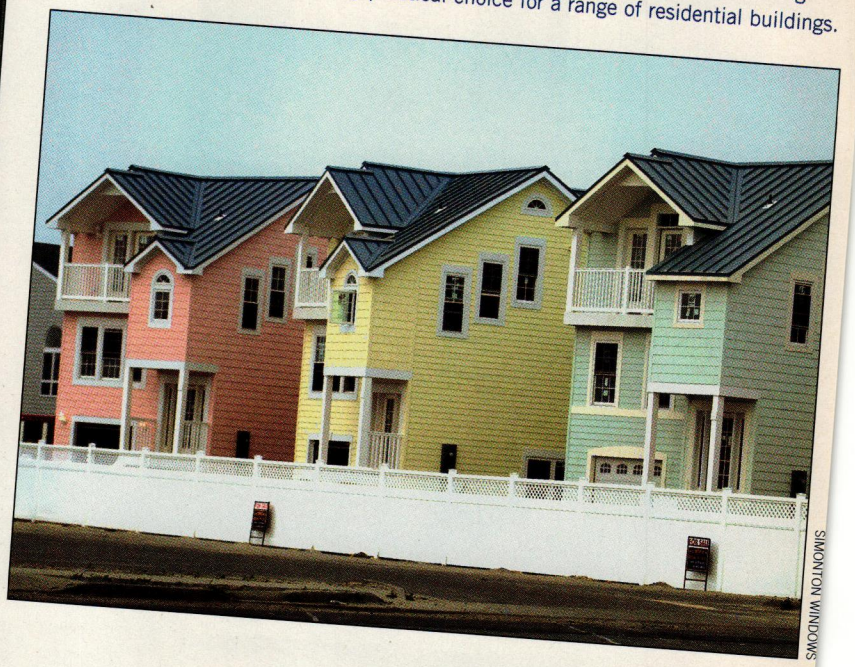


SIMONTON WINDOWS

FIGURE 3. An impact-resistant window can shatter and still pass the large missile test if the window remains largely intact through the 9,000 pressure cycles. The glass fragments tend to adhere to the plastic interlayer, which is considered intact if the size of any rips that develop during the test total less than 1/16 inch wide by 5 inches long.

FIGURE 4. Many windows would be very difficult to reach to install shutters, making impact-resistant windows the only practical choice for a range of residential buildings.



SIMONTON WINDOWS

However, though more convenient, impact-resistant windows do not necessarily offer the best protection. According to the Institute for Business and Home Safety (IBHS), steel storm panels that meet the Dade County standards for opening protection offer the highest level of protection possible. These products will prevent the windows behind them from breaking and keep water out better than impact-resistant windows or movable shutter systems.

Plywood can be used for shutters, but according to the IBHS, to get near the protection offered by Dade County–approved storm panels requires 3/4-inch plywood, which makes for heavy shutters that are difficult to install. (IBHS recommends plywood over OSB, as it takes 30% thicker OSB to equal the impact resistance of plywood. See "Evaluating OSB for Coastal Roofs," Winter 2005; available at www.coastalcontractor.net.) Lighter 3/8-inch-thick plywood shutters offer only about half as much resistance to penetration as 3/4-inch plywood and provide few assurances that the building shell will not be breached during a major storm. Clear polycarbonate shutters offer nearly the same impact resistance as storm panels and are relatively light. Roll-down shutters, the most convenient option, often require putting up storm bars to offer adequate impact resistance.

The convenience offered by impact-resistant laminated glass may also mean the difference between adequate protection for the structure and its occupants or none at all. Post-hurricane damage assessments always turn up evidence of homes that were damaged because owners were unable to make arrangements to install shutters before a major storm struck. "Shutters," argues Dave Olsen, a code expert with Florida-based window maker PGT Industries, "demand that the homeowner is home, and able, to install them."

Cost. The most frequently cited shortcoming of impact-resistant glass is the cost. The added cost per unit varies with window size, shape, and design pressure (DP). Large windows, circle tops, and high-DP units add proportionally more to the price tag. Price quotes in the Florida and Virginia markets for double-hung units by several different manufacturers revealed costs for impact-resistant windows $150 to $350 higher

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than comparable units with conventional insulated glazing (for an added cost of about $13 to $30 per square foot of window area, with aluminum and vinyl windows at the lower end of the price range and clad wood at the upper end). This increase works out to $4,160 to $9,600 for 320 square feet of window area (or 20% window-to-floor area in a 1,600-square-foot home). In many southeastern markets, such an upcharge, which does not include markup or any added labor, might be a significant increase to the cost of a house, but in most housing markets along the mid-Atlantic and New England coast, it would likely be a relatively small proportion of the total house price.

Window manufactures cite a study commissioned by the North American Laminated Glass Information Center, which concludes that the cost for laminated glass is less than the installed cost of roll-down shutters — the most convenient but also most expensive shutter option available. The "Hurricane Shutter Guide" published by the South Florida *Sun-Sentinel* confirms this conclusion, estimating the installed cost of roll-down shutters to be $26 to $40 per square foot, or $8,320 to $12,800 for the equivalent window coverage used to compare window costs as noted above (320 square feet). The installed cost for the equivalent size and number of steel storm panels ranges from $1,280 to $2,240 — considerably less than the upcharge for laminated glass but considerably less convenient as well.

Added value. The benefits to using laminated glass go far beyond convenience in meeting the destructive force of a tropical cyclone. The clear advantages that should help justify the higher costs for impact-resistant windows include:

- **Security.** It's as difficult for a burglar to shatter a laminated windowpane as it is for a wind-blown roof tile to smash through it. Therefore, this option is especially attractive for vacation homes that are unoccupied for much of the year. Few beach communities allow homes to remain shuttered for more than a few hours before and after a storm (and few homeowners would be wise to do so, as it is an invitation to burglars, who will know nobody's home). Laminated glass also provides a measure of safety protection: Children are unlikely to fall through a laminated window or get hurt by a broken pane.
- **Sound dampening.** Glass is inherently brittle and readily transmits sound vibrations. Adding a flexible interlayer has the same effect as putting a finger on a drumhead: It deadens the vibration. An ordinary double-pane insulated glass window has a sound transfer coefficient (STC) of 28. When made with laminated glass, the window's STC jumps to 35 — about the same as an insulated 2x4 wall with 5/8-inch drywall on both sides.
- **UV protection.** The plastic interlayer blocks ultraviolet light, which might otherwise cause carpets and home fabrics to fade and vinyl flooring to yellow.

PGT's Olsen says that laminated glass has become a standard feature on a majority of windows sold in Europe, not for protecting homes from hurricanes but for the increased security, safety, and sound resistance afforded by these units. And he points to the fact that prices have fallen as manufacturers have become more familiar with the thicker glazing and have filled out their window lines.

SIMONTON WINDOWS

FIGURE 5. The Pressure Test: In the laboratory, wind pressures applied to a window in a high-wind event are simulated by applying a static pressure across a random window specimen for a prescribed amount of time and measuring the maximum uniform load deflection.

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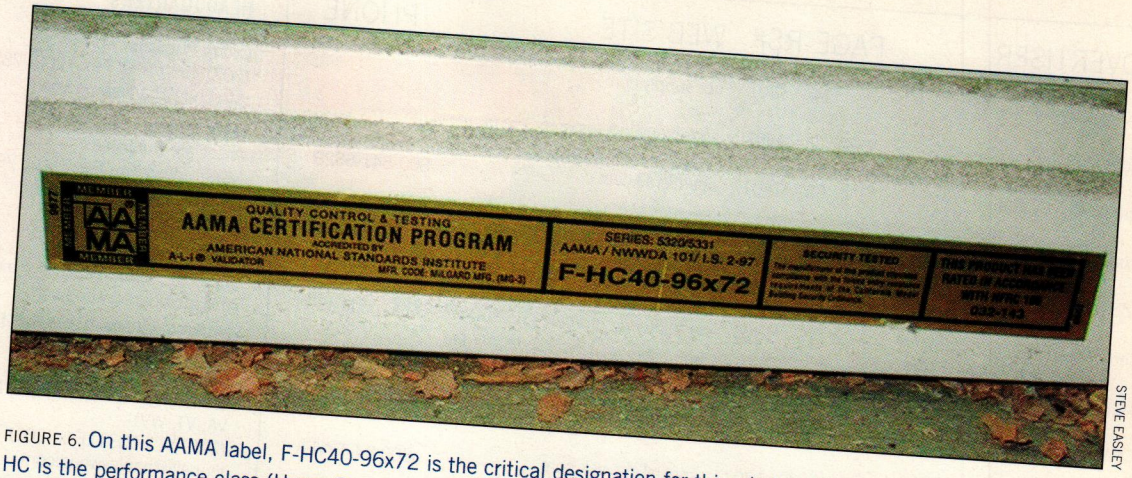

STEVE EASLEY

FIGURE 6. On this AAMA label, F-HC40-96x72 is the critical designation for this window. F is the product type (Fixed); HC is the performance class (Heavy Commercial); 40 is the performance grade (40 psf design pressure); and 96x72 is the maximum size tested (width x height).

DESIGN PRESSURE

Impact resistance and design pressure are two distinct structural requirements for windows used in hurricane zones: One resists failure from wind-blown debris, and the other resists failure caused by sustained wind pressure.

Wind pressures are simulated in the laboratory by applying a static pressure across a window specimen for a prescribed amount of time and measuring the maximum uniform load deflection (**Figure 5**, page 48). During this test, pressure is applied in both directions, simulating sustained positive and negative wind loads. Design pressure will vary with area, so the window dimensions are critical to choosing the correct design pressure.

Window Classes	Design Pressure	Structural Test Pressure	Water Resistance Test Pressure
Residential	15	22.5	2.86
Light Commercial	25	37.5	3.75
Commercial	30	45	4.5
Heavy Commercial	40	60	6
Architectural	40	60	8

FIGURE 7. The water resistance value required for the AAMA/NWWDA 101/I.S.2 standard is 15% of the design pressure for all window class, except Architectural class, which requires a water penetration resistance at 20% of design pressure. While required by code for any window, this standard is not intended to evaluate the performance of windows in hurricane zones. All windows that meet these basic performance criteria will leak in any major tropical storm.

To comply with the International Residential Code, all windows in high-wind zones must meet the "Components and Cladding" requirements, found in prescriptive tables listing minimum design pressures for windows in different positions on the house exterior. For example, windows placed near corners, where the wind pressures are highest, must have a higher design pressure. (For a detailed discussion of these window performance requirements, see again "Specing Windows in High-Wind Zones," Winter 2005; available online at www.coastalcontractor.net.)

The design pressures used to meet the code's "Components and Cladding" requirements should not be confused with the pressure ratings that are central to the joint specification from the American Architectural Manufacturers Association (AAMA) and the National Wood Window and Door Association (NWWDA). Known as AAMA/NWWDA 101/I.S.2 (or shorthand as AAMA 101), this standard defines the baseline performance characteristics required for every window, regardless of the market. The primary specification is a "structural test pressure" rating, which is established using a test procedure developed by ASTM that evaluates the window after applying a pressure 50% higher than the design pressure. If no permanent deformation occurs to the window, it passes the test and is awarded a small gold label affixed to an inside surface of the frame (**Figure 6**). However, the minimum design pressure rating listed in AAMA 101 may be lower than what is required for "Components and Cladding." For example, the AAMA 101 baseline for residential-class windows starts at a minimum design pressure of 15 psf. While this pressure is equivalent to the pressure sustained by a 75-mph wind — the

defining wind speed for a Category 1 hurricane — it would not pass muster in any coastal wind zone.

Currently, the AAMA 101 draws a distinction between several classes of windows, with residential (R) at the low end of the design pressure range, and heavy commercial (HC) and an unspecified "architectural" (AW) class at the upper end. Dean Lewis, manager of product certification for the AAMA, has suggested that these distinctions may become obsolete as more and more residential windows are being made to meet higher design pressures.

WATER PENETRATION

In addition to the structural performance ratings, AAMA 101 also establishes minimum air infiltration and water penetration values (**Figure 7**, page 50). The water penetration values are found using an ASTM test procedure that applies a negative pressure equal to 15% or 20% (depending on the window's performance class) of the design pressure to the inside of the test assembly, and then hoses the window exterior with a rack of water jets that is equivalent to a rainfall of 8 inches per hour (**Figure 8**). At best, a window meeting the AAMA 101 spec will leak in a 35-mph wind, which virtually guarantees it will leak in a hurricane.

The assessment of Joe Lstiburek of Building Science Corporation is even worse: In developing a report commissioned by the Florida Home Builders Association to evaluate the high incidence of water damage to homes during the 2004 hurricane season, Building Science Corp. found that most windows leak when no pressure is applied. For that report, Building Science Corp. tested 50 windows. "We had 100% failure," notes Lstiburek. "Okay, it was 'only 50 windows,' you might say. 'There are thousands of windows available.' But when every one of them leaked, we felt pretty safe drawing the general conclusion that windows leak."

The AAMA acknowledges the problem and issued the statement: "The lesson learned in 2004 is that water penetration from heavy wind-driven rains occurred in more cases than acceptable, leading to interior water-related damage that could have been prevented." And an AAMA Southeast Region Hurricane Standard Development Task Group is currently gathering data on real-world indoor/outdoor pressure differentials due to hurricane-force winds to find ways to better simulate actual wind gusting and effects of turbulent wind flow.

But despite his report, Lstiburek feels that the results should be kept in perspective. For starters, he contends, it's significant that the windows won't blow out, and the occupants can remain safe inside during a major wind event. In addition, the water leakage for windows is not just a shortcoming for the windows. "There are no standards for the walls, which will leak much more than the windows," said Lstiburek. "The point is, let's accept that walls and windows leak. But let's design them to first drain to the exterior, and second to dry out if they do get wet. That's the best way to avert widespread water damage." If the main criterion is reducing water leakage, Lstiburek recommends sealing the roof vents where the most water is likely to come into a home, and cause the most damage, during a hurricane. ~

Clayton DeKorne is the editor of Coastal Contractor.

SIMONTON WINDOWS

FIGURE 8. The Water Test: To meet AAMA minimum water penetration rating, a sample window is subjected to a negative pressure equal to 15% or 20% of the design pressure across the inside of the test assembly. The window exterior is then hosed down with a rack of water jets that is equivalent to a rainfall of 8 inches per hour. If any leakage occurs on the interior, the window does not pass.

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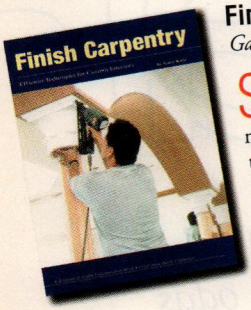

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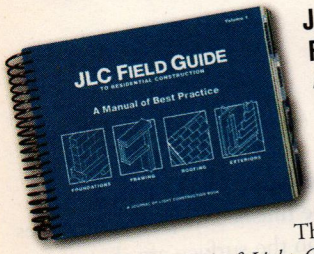

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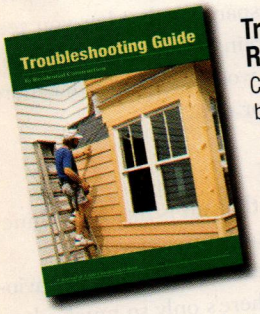

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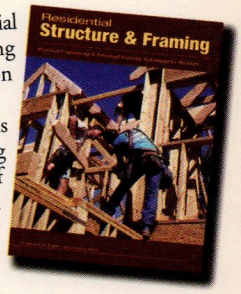

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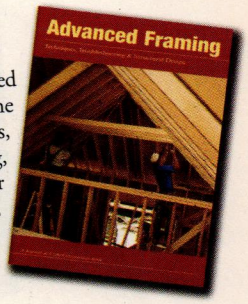

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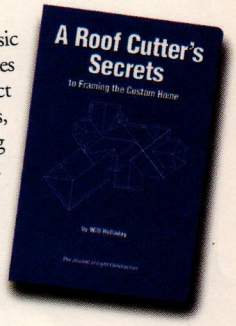
Will Holladay



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In the Clear

No clear finish can beat the sun for long, but there are ways to improve the odds

by Ted Cushman

High-end homes in prime locations often boast the best in exterior woodwork, including costly entry doors of oak, mahogany, teak, or even cherry. And that means potential trouble. Entry doors on a coastal home stand directly in harm's way, sandwiched between the indoor and outdoor climates and often facing blazing sun, soaking rain, and drying wind.

One solution is to protect the entry door with durable solid-color paint. "I've worked on 200-year-old exterior doors and shutters whose wood was as fresh as new," says veteran contractor Greg Sullivan of Marion, Mass., whose career has included high-end architectural woodwork and finishing as well as commercial and residential building and remodeling.

New Jersey door-finishing specialist Dave Anderson notes, "I sometimes mention paint to people." Anderson finishes or refinishes about 70 top-end entry doors a year, many of them on multimillion-dollar houses facing the rivers, bays, and beaches near New York City. But Anderson finds that his clientele is not very interested in the paint option: "If they're spending $25,000 on a custom-built mahogany door," he observes, "they don't want to hear about that."

Another commonsense idea is to shelter the door under a broad overhang or portico (**Figure 1**, page 56). "I have one customer who owns a gigantic, 15,000-square-foot, house, with zero overhangs over a 25-foot door unit," explains Anderson. "I've done his door two or three times already. Now he is going to build a big portico over it. Wood can be finished only so many times before all the cells on the surface are shot — at least as far as making finish adhere to them."

If customers don't want to hear about either paint or shelter, however, they are going to have to hear about maintenance and refinishing. Clear or translucent finishes need continual reapplication, because they don't have anywhere near the durability, or the protective power, of paint. The same transparency that lets you see the beautiful wood grain also lets damaging rays of sunlight reach the wood — a factor far more damaging than wind or rain.

SOLAR BOMBARDMENT

Even through clouds, the sun is like a machine gunner taking all-day target practice on a house, showering the exterior with tiny ultraviolet (UV) bullets. And there's only so much ultraviolet radiation that either wood or finishes can take. Photons of UV shatter the electrical bonds that hold molecules together and energize the remaining atoms to react with nearby materials or with oxygen from the air. The results: faded colors, torn and bleached wood fiber, and brittle, broken-down film coatings (**Figure 2**, page 56). Coatings may erode, split, crack, yellow, peel, buckle, bubble, or curl; what they won't do is last.

"I paint a doom-and-gloom picture for my customers because whoever sold them the door

DAVE ANDERSON

JELD-WEN WINDOWS AND DOORS

A finisher applies a two-part ("2K") clear polyurethane to a white oak entry door at the Jeld-Wen door factory (above). Door-finishing specialist Dave Anderson (left) touches up the edge of a distressed alder door from International Wood Products (a Jeld-Wen division) in his finishing shop after changing the handing on the door. Anderson says that whether factory-applied or field-applied, 2K urethanes are very tough when new but strip easily with paint stripper after several years of exposure to the sun. He expects a urethane finish to last anywhere from two to seven years without maintenance, depending on solar exposure, before the door needs to be completely stripped and refinished.

probably didn't," says Dave Anderson. "I tell them, 'You put clear finish on wood outside, and you are going to have to maintain it. And that will be expensive and very time-consuming.'"

BLOCKING UV

UV blocking turns out to be difficult because the coating has to defend not just the wood but also itself from the sun's bombardment. Most formulas contain finely ground metallic compounds, such as titanium dioxide (TiO_2) and iron oxides called "trans-oxides." These tiny flakes are mostly transparent to visible light but reflective to the shorter-wave ultraviolet. They aren't 100% transparent, however, so the more you apply, the more the wood grain is obscured.

In addition, there are UV-absorbing compounds — typically organic (carbon-based) molecules — that soak up the UV and release it as heat. Those are included in formulas to protect the coatings themselves as well as the wood beneath.

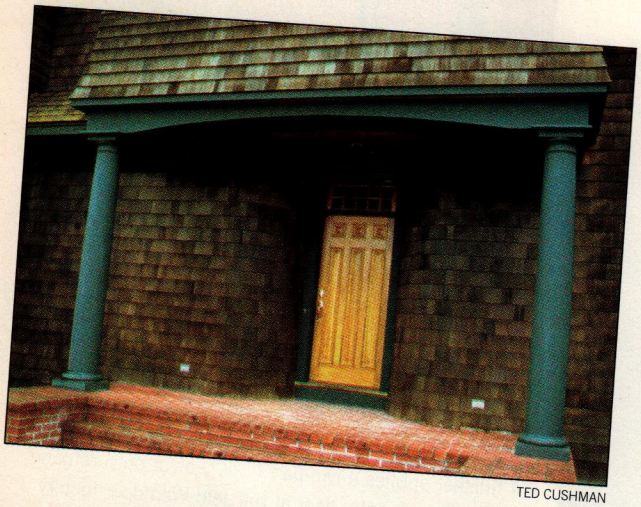
Neither the reflective nor the absorptive UV protectant is 100% effective. The absorbers eventually wear out and break down. The reflectors let enough UV through that the wood will ultimately get a sunburn. And while a heavy dose of UV protectant is the key to an effective coating, there's no way to load up a coating with enough to provide perfect protection and still see the natural wood. "If you put enough material in to totally protect the wood, you've got paint," explains Greg Sullivan.

Paint chemist Steve Smith points to another helpful additive: "antioxidant" chemicals that help keep molecules from reacting with oxygen when they're hit with UV photons. These additives can protect a urethane coating in much the same way that antioxidant vitamin E helps protect human skin, says Smith. But he notes that coatings that cure by oxidation, such as spar varnishes, can't use antioxidants in the formula, because they inhibit the curing of the film.

Unfortunately, it's hard to know how much UV blocker you're buying in each can of finish. The type and quantity of UV blockers in a coating formula is the one secret that manufacturers guard most jealously. "I'm told that if they put one drop of UV inhibitor in the formula, they can label it as a UV-inhibiting coating," says Dave Anderson. "But it takes a lot more than a drop to have any real effect."

Steve Smith points out that the coverage of a given finish is typically what determines whether you've put enough blocker between the sun and the wood. Smith provides clear instructions specifying the volume of liquid to use for a given application. This way, he knows how much UV blocker will be sitting on each square foot of exposed surface. When you use a coating that doesn't come with similar instructions, it may take some trial and error to develop a feel for how many coats are needed.

UV blockers and solid film-forming ingredients are the high-cost ingredients in



TED CUSHMAN

FIGURE 1. Clear finishes last longer when sheltered from direct sun, as in the entry to this Rhode Island home by architect/builder Andrew DiGiammo. The more exposed wood trim has been painted on this house, and wood shingles have received an opaque stain.

a clear exterior finish. The better the quality and higher the concentration of those components, the better the finish will perform — and the more you'll pay for it.

CLEAR-COAT OPTIONS

When evaluating a clear finish, the most important question is this: How well will it stop UV? To evaluate a product, the experience of boatbuilders proves much broader than that of home builders. Here's a quick look at the top choices from the perspective of woodworkers with extensive marine experience:

Spar varnish. The traditional favorite is the yachtsman's old standby, marine-grade spar varnish, made from a base of natural oils. (Tung oil, a nut oil from Asia, is typical, but linseed oil, soy oils, and other natural oils are also used.) The oil is chemically modified to form "alkyd" molecules and is mixed with metallic catalysts to speed drying (unmodified linseed oil, an old-fashioned boat finish, can take forever to dry). The alkyd films cure by reacting with oxygen from the air as well as by evaporation of solvents and thinners in the formula. The best spar varnishes have high concentrations of "long oil," which forms long, flexible chains in the cured film. They also have heavy loadings of UV-blocking chemicals.

Boatbuilder Doug Randolph-Foster says he's tried every finish out there, but he still prefers traditional spar varnish (**Figure 3**, next page), despite the fact that it requires a laborious, painstaking application. He starts with a careful sanding that includes a final hand-sanding with 220-grit paper. He then wet-sands the wood using tung oil, linseed oil, or an Epifanes flow-enhancer called Easy-Flow, working the sawdusty slurry into the wood grain. Then he wipes it off with a clear rag and leaves the wood to dry overnight. Next comes a seal coat of Epifanes varnish thinned 50% with Epifanes thinner, let to dry, and sanded again with 220- or 320-grit paper. Finally, it's time to brush on full-strength coats of varnish — as many as 10 of them, sanded between coats. Full-strength, the Epifanes varnish is thicker than most brands, says Randolph-Foster — "not necessarily harder to flow out, but different. Some guys hate it. I love it, and I hate everything else."

Two-part polyurethane. The modern alternative to spar varnish is two-component ("2K") polyurethane, a plastic that can be derived, like spar varnish, from natural oils but is often synthesized from petrochemicals. Two-part urethanes cure through reactions involving ingredients in the formula rather than by reacting with air. However, they also release evaporating solvents as well as volatile reaction products.

There are water-based polyurethanes that don't release volatile organic compound (VOC) solvents, but they don't have much of a track record on exteriors. Door-finishing specialist Dave Anderson notes,

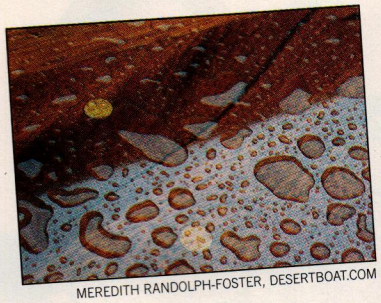
FIGURE 2. At right, two doors on opposite sides of the same street show the effects of different solar exposures. The two-part polyurethane clear coat on a mahogany door on the sunny side of the street (right) is beginning to whiten and crack after just two years in the sun and will soon need to be stripped and reapplied. The same finish on a white oak door on the shady side of the street (far right) is still going strong after five years in place. "Wind and rain don't have that much to do with finish performance," explains finisher Dave Anderson. "It's mainly the sun." However, once the finish begins to fail, water damage to the underlying wood becomes a risk, adding urgency to the need to refinish.

"I have tested a lot of water-based exterior urethanes, and I haven't seen one last at all, so far." Stricter regulations may yet force the use of water-based finishes; "That's when I'll retire," says Anderson.

According to Anderson, 2K urethanes are "a nightmare" to strip when fresh, in case of a mistake, but they easily come off with paint thinner and a putty knife after several years of direct exposure to sun.

Cetol. Then there are the advanced and somewhat mysterious offerings of modern chemistry. Popular among both boat owners and land-locked wood finishers is Cetol, an advanced system from Sikkens (widely available from professional paint stores; a good online source is www.jamestowndistributors.com). Greg Sullivan prefers the Cetol system because of its relatively low-build film, which is easily rejuvenated on site without major stripping. The topcoat dusts off gradually but can be renewed with light sanding, followed by reapplication with a brush.

The Sikkens Cetol system includes a primer/sealer base coat and a selection of clear and lightly pigmented topcoats. The formulas are a trade secret, but the coatings have a lot in common with better-known recipes — the base coat seems to behave somewhat like a penetrating epoxy, finishers say, while the renewable topcoat acts a lot like a modified oil-based alkyd spar varnish. An orangish cast in the Cetol topcoats seems to suggest some sort of iron oxide–based UV blocker. But as Steve Smith, the owner of rival (and much smaller) California-based coating maker Smith and Co. (800-234-0330; www.smithandcompany.org), notes, no coating maker will gladly divulge what's really inside the can — or in what proportions. "We paint chemists have our secrets," says Smith.



MEREDITH RANDOLPH-FOSTER, DESERTBOAT.COM

TED CUSHMAN

FIGURE 3. The reason boat owners love spar varnish is shown above: a deep, rich, clear coat that repels water and reveals all the beauty of the wood. A finish like this takes 10 to 12 coats, however, and needs continual attention to maintain its good looks. Without a yearly sanding and refreshing, varnish fails by yellowing and peeling (right). When that happens, it's time for sanding back to bare wood and starting over.

Clear epoxy. Smith is the developer, 30 years ago, of one version of another popular coating option: clear epoxy. Smith and Co.'s Clear Epoxy Penetrating Sealer or CEPS (also marketed as MultiPrimer), has a die-hard following among boat owners who use it as a base for multiple topcoats of conventional spar varnish. (Five Year Clear, a recently introduced two-part polyurethane from Smith and Co., has yet to develop the same fan base, but it has performed well in boating magazine comparison tests, and Smith claims some owners have gotten as much as 10 years out of it.) MultiPrimer is almost as thin as water, and Smith says it penetrates wood more deeply than typical thicker epoxy coatings. But some boat owners still stick with a thicker epoxy such as Gougeon Brothers' West System (866-937-8797; www.westsystem.com), sometimes using added thinner to aid flow and penetration.

Best of both worlds. "The epoxy base, with traditional spar varnish on top of it, is almost the best of both worlds," says Doug Randolph-Foster. "The epoxy will essentially last forever as long as you keep a good UV-inhibiting varnish on top of it." ~

Ted Cushman reports on the building industry from his base in Great Barrington, Mass.

PHOTOS: DAVE ANDERSON

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High-Performance Underlayment

Lighter and stronger than 30-lb. felt

Grace Tri-Flex 30 is a spunbonded polypropylene sandwiched between layers of UV-stabilized polypropylene that provides a slip-resistant roofing underlayment that won't tear away from nails in high winds, even when left exposed. According to the manufacturer, Tri-Flex can be left exposed for up to six months without drying out or rotting at high temperatures, or cracking and becoming brittle at low temperatures. Weighing only 30 pounds for a large, 10-square roll, Tri-Flex is much lighter than 30-lb. felt, making installation easier. Tri-Flex 30 must be attached to the roof deck with roofing nails or staples through 1-inch-diameter plastic or metal caps. It's critical that the deck surface is swept clean and dry and that the material is pulled taut, but not stretched, when applied. Suitable for both new construction and reroofing, Tri-Flex meets the International Building Code as well as Florida Building Code requirements for roof coverings in high-velocity hurricane zones. For more information, contact Grace Construction Products, 866-333-3726; www.graceconstruction.com.

TRI-FLEX 30

36-Volt Power Tools

Reportedly deliver two to three times more run time than 18-volt tools

Following its older sister, Black & Decker, DeWalt has stepped up the power threshold for cordless tools by introducing a line of **36-volt cordless power tools**, including a hammerdrill, reciprocating saw, 7 1/4-inch circular saw, jigsaw, impact wrench, rotary hammer, and flashlight. The tools will be sold in two-, three- and four-piece combo kits.

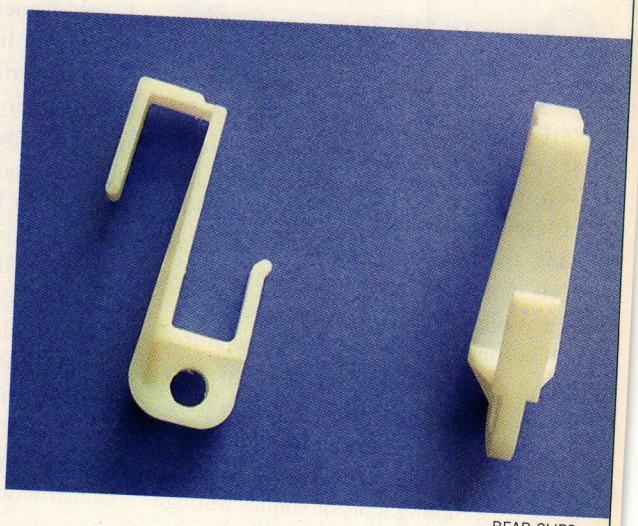

DEWALT 36V CORDLESS PLATFORM

To create the battery for this 36-volt platform, DeWalt partnered with A123Systems to develop a new generation of lithium-ion batteries using technology licensed from researchers at MIT. The new batteries reportedly offer greater service life, more power, and longer run time than conventional lithium technology. According to DeWalt, independent third-party testing of the new tool line found that the DeWalt 36-volt platform provides two to three times more run time than 18-volt tools. The manufacturer claims the circular saw, for example, is capable of averaging 64 cross cuts through a 2x10, while the hammerdrill can drill an average of 67 holes through 2x material using a 2 9/16-inch self-feed bit. For more information, contact DeWalt Industrial Tool Co., 800-433-9258; www.dewalt.com.

Drainage-Plane Clips

Clips for installing siding also aid drainage

Fiber-cement siding has become increasingly popular because it is attractive, durable, and low maintenance. It is also heavy and requires extra time and labor to install. Enter the **Bear Clip**: Invented by a siding installer, who claims his Bear Clips increased his productivity by 40%, the small plastic clips are slipped over the top edge of a lower course of siding, automatically providing a 1 1/4-inch overlap. The manufacturer recommends three clips for each 12-foot fiber-cement plank. Once the siding courses are nailed off, a clip removal tool (provided with the clips) is used to detach the exposed front portion. The hidden back portion stays in place, providing a small shim that creates an air gap on the back side of the siding, promoting drainage of wind-blown rain and other moisture that will inevitably get behind the siding. For more information, contact Parksite Plunkett-Webster, 800-399-3779; www.parksite.com.



BEAR CLIPS

Bendable Borders

Rot-resistant composite landscape edging

EverGreen Wood Composites offers a line of long-lasting landscaping materials that will neither rot nor suffer insect damage. The wood-plastic composites are available in both a thin, flexible profile designed for edging (**EverEdge**) and a thick, rigid profile designed to be used as a border timber (**Landscape Timber**). Both profiles can be used in place of traditional materials such as metal, plastic, or wood, which can deterioriate from rust, rot, or termites. In addition, the composite materials will not leach harmful chemicals or preservatives into homeowners' flowerbeds or gardens. Made from 100% recycled wood flour and plastic resin, EverGreen landscape edging can be tooled like wood and contains no chemical compounds that will accelerate the corrosion of fasteners and flashing. For more information, contact Evergreen Wood Composites/ICT, Inc., 478-472-1155; www.evergreenwood.com.

EVERGREEN LANDSCAPE TIMBER

Impact-Resistant Glass Block System

Silicone adhesive supplies the strength

PITTSBURGH CORNING GLASS BLOCKS

Pittsburgh Corning offers a glass block system that meets hurricane impact code requirements for residential and commercial buildings in high-wind zones. Using its **Thickset 90 glass blocks**, which have a greater face thickness than standard glass blocks, and an innovative silicone adhesive to cement the blocks together, the system achieves a 100-psf design pressure for a 4- by 4-foot window area (or 68 psf design pressure for a 6- by 6-foot area). The adhesive relies on spacers that accurately align the blocks and provide a consistent joint thickness. The high-strength silicone agent used to adhere the block to the spacers comes in a clear version that cures to a clear finish, giving the assembly an all-glass appearance. For more information, contact Pittsburgh Corning Glass Block, 800-624-2120; www.pittsburghcorning.com.

Efficient Bracing

Gypsum-based sheathing installs faster than plywood

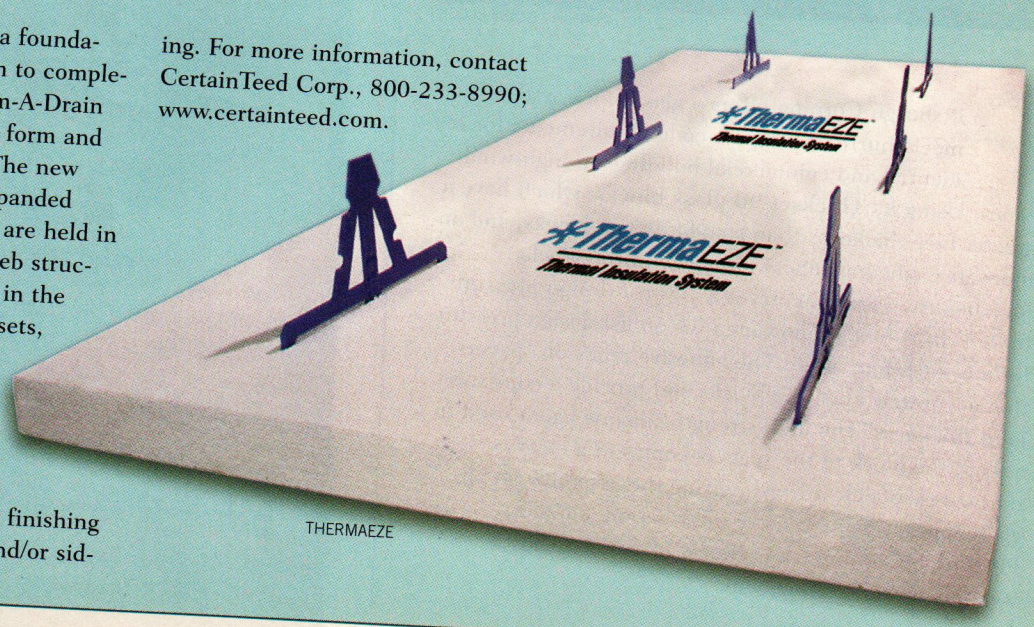
Available in 1/2- and 5/8-inch thicknesses, and in 8-, 9-, 10-, and 12-foot lengths, **Temple-Inland's StructGuard TS** is stiff enough to meet all major model-code structural requirements for racking resistance, yet can be cut with a utility knife. With a rating between 20 and 24 perms, depending on the thickness, it will breathe better than plywood, OSB, or 30-lb. felt. The manufacturer recommends taping the seams with a foil tape, such as Polyken 626-35, and using self-adhesive flashing at window and door openings to limit water infiltration. And, while no one should rely solely on the mold-resistance of an exterior sheathing to prevent mold, in hot, humid regions it's sometimes hard to control the vapor drive, so there is a risk of moisture condensing on wall sheathing surfaces. In such cases, StructGuard TS structural gypsum sheathing might provide an added level of protection: The sheathing has been treated to reduce mold growth. For more information, contact Temple-Inland, 800-231-6060; www.templeinland.com.

STRUCTGUARD TS

Integral Insulation

Foundation forming system automatically provides an R-11 concrete wall

CertainTeed's offering a foundation insulation system to complement its popular Form-A-Drain — an integral footing form and perimeter drainage system. The new system, **ThermaEze**, uses expanded polystyrene foam panels that are held in foundation wall forms by a web structure that becomes embedded in the concrete. Once the concrete sets, the forms are removed, creating a wall surface that is fully insulated on the interior and/or exterior faces of the structure. The webs also provide a fastening surface for finishing basement walls with drywall and/or siding. For more information, contact CertainTeed Corp., 800-233-8990; www.certainteed.com.



THERMAEZE

Katrina by the Numbers

by Aaron Hoover

Total number of single-family homes, mobile homes, and apartments destroyed by Hurricanes Katrina and Rita: **355,889**
American Red Cross, Katrina and Rita Disaster Assessment (10/30/05)

Total number of damaged dwelling units: **538,007**
American Red Cross, Katrina and Rita Disaster Assessment (10/30/05)

Number of occupied emergency trailers and mobile homes as of early December: **38,440**
The New York Times, Op-Chart, "Rebuilding Progress" (12/7/05)

Number of evacuated families in hotels: **41,953**
The New York Times, Op-Chart, "Rebuilding Progress" (12/7/05)

Number of temporary "blue roofs" installed on damaged homes by the U.S. Army Corps of Engineers in Louisiana as of mid-November: **70,000**
New Orleans CityBusiness, "Blue Roof Program Coming to a Close in 34 Louisiana Parishes" (11/14/05)

Cost per average 1,500-square-foot roof: **$2,500**
JLC, "Top-Dollar Tarps" (12/05)

Estimated tons of debris in Southeast Louisiana following Katrina: **22 million**
The Times-Picayune, "Three Decades Worth of Trash" (11/16/05)

Estimated tons in New Orleans alone: **12 million**
The Times-Picayune, "Three Decades Worth of Trash" (11/16/05)

Tons of garbage generated in New Orleans in an average year: **350,000**
The Times-Picayune, "Three Decades Worth of Trash" (11/16/05)

Total number of ruined refrigerators processed for recycling in New Orleans as of mid-November: **131,925**
The Times-Picayune, "Ruined Refrigerators Have Become a Familiar, Even Evocative Sight" (11/27/05)

Estimated number of vehicles damaged by Katrina floodwaters: **350,000**
The Times-Picayune, "Three Decades Worth of Trash" (11/16/05)

Number of open public schools in New Orleans before Katrina: **116**
The New York Times, Op-Chart, "Rebuilding Progress" (12/7/05)

Number of open public schools after Katrina as of early December: **1**
The New York Times, Op-Chart, "Rebuilding Progress" (12/7/05)

Number of construction jobs lost in Louisiana and Mississippi from August through September: **27,000**
Houston Chronicle, "Five Questions with Ken Simonson" (11/16/05)

Unemployment rate in New Orleans before Katrina: **5.8%**
The New York Times, Op-Chart, "Rebuilding Progress" (12/7/05)

Unemployment rate after Katrina: **15.5%**
The New York Times, Op-Chart, "Rebuilding Progress" (12/7/05)

Number of mold spores per cubic meter measured in some flooded New Orleans homes: **3 million**
The Times-Picayune, "The Same Old Same Mold" (10/29/05)

"Very high" levels of outdoor mold spores per cubic meter as defined by the American Academy of Allergy, Asthma and Immunology: **50,000** http://www.aaaai.org

Amount charged by professional mold remediators: **$10 to $12 per square foot**
The Times-Picayune, "The Same Old Same Mold" (10/29/05)

Number of days it took for the National Flood Insurance Program to empty its coffers following Hurricane Wilma's U.S. landfall on October 24: **18** *The Times-Picayune*, "Congress OKs Adding Flood-Insurance Dollars" (11/19/05)

Total number of flood claims filed following the three hurricanes as of mid-November: **230,000** *The Times-Picayune*, "Congress OKs Adding Flood-Insurance Dollars" (11/19/05)

Percentage increase in price of diesel fuel October 2004 to October 2005: **59** *Milwaukee Journal Sentinel*, "Contractors Brace for Higher Prices" (11/29/05)

Post-Katrina and -Rita percentage increases in the price of polyvinyl chloride (PVC) pipe depending on geographic region: **20 to 100**
St. Petersburg Times, "Builders Declare Hardship" (11/26/05)

Increase in the price for a square (10 feet by 10 feet) of architectural shingles in Louisiana after Katrina: **$10**
The Times-Picayune, "No Quick Fixes" (11/19/05)

Rise in Entergy Corp.'s third-quarter earnings despite extensive damage to its New Orleans unit from Hurricanes Katrina and Rita: **24%** *Associated Press*, "Entergy Profits Rise Despite Hurricane Damage" (11/1/05)

Rise in Harrah's Entertainment Inc.'s third-quarter profits despite destruction of its casinos in Biloxi and Gulfport and serious damage to its Lake Charles casino: **42%**
Associated Press, "Harrah's Posts Profit Rise with Caesars Buy, Despite Hurricanes" (11/3/05)

Total Louisiana state budget deficit following Katrina: **$959 million** *Associated Press*, "Notes from the Louisiana Legislature's Special Session" (11/9/05)

Total estimated cost of a major hurricane hitting Miami in 2020 if current construction and property value trends continue: **$500 billion** *The New York Times*, "In Study, a History Lesson on the Costs of Hurricanes" (12/8/05)

LIZ ROLL