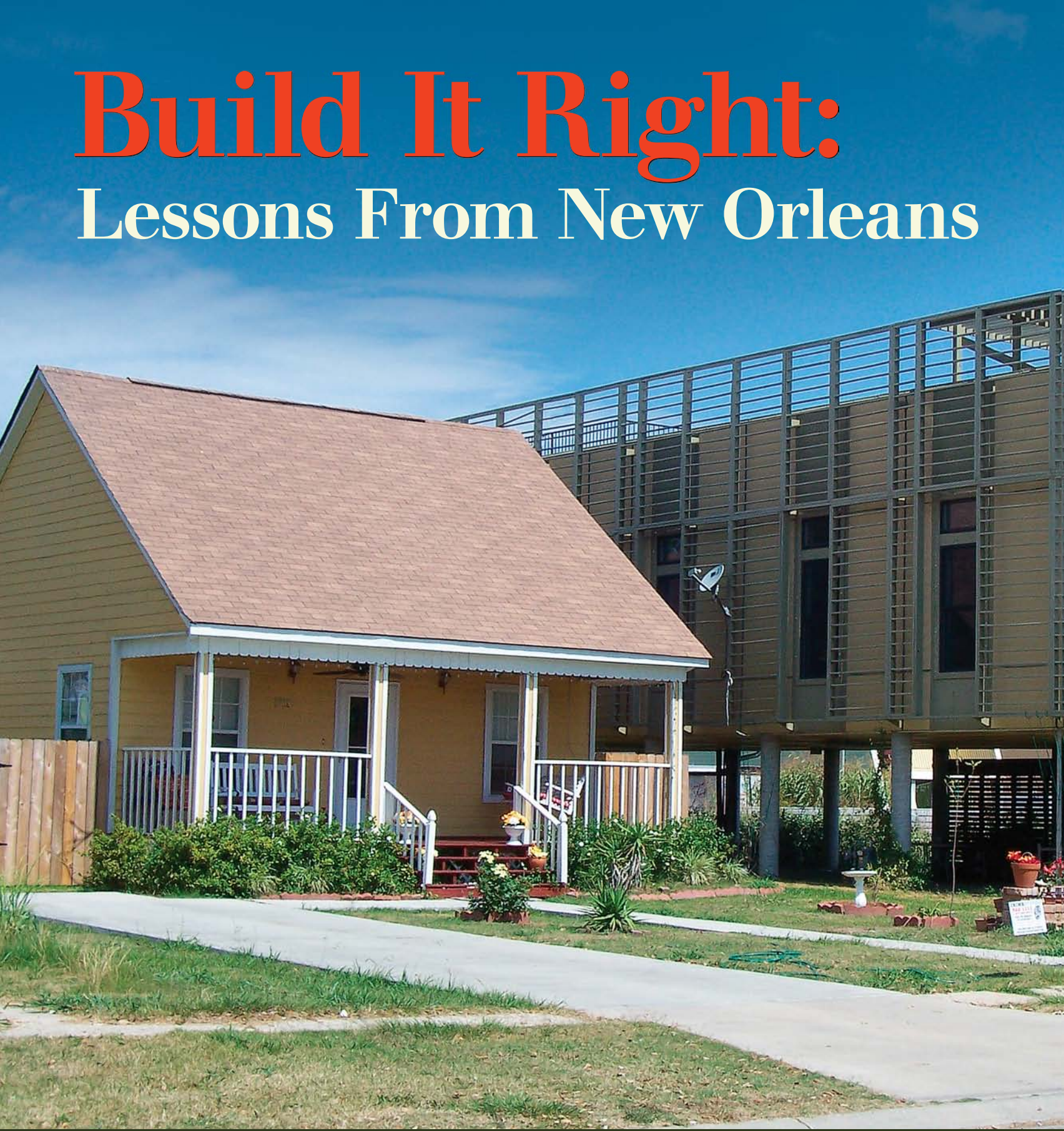
Build It Right:
Lessons From New Orleans



Hurricane Katrina can teach us many things. Make It Right wants safe, affordable, energy-efficient building to be one of them.

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BY LINDA REEDER

About 70% of occupied homes in New Orleans were damaged in 2005 after the levees failed during Hurricane Katrina. In the Lower Ninth Ward alone, more than 4000 homes were destroyed.

Two years after the storm, few homes in that low-income, historically African-American neighborhood had been rebuilt. In response, actor and part-time New Orleans resident Brad Pitt launched Make It Right (MIR), with the goal of building 150 new houses in the Lower Ninth Ward so that some former residents could return to a restored community.

While 150 houses might seem like a drop in the bucket in the face of so much devastation, the goal of MIR is not to replace every home destroyed, but to replace as many as it can with homes that are safer, more healthful, more energy efficient, sustainable, and affordable. The organization also hopes to leave a lasting impact on our ability to build houses to these standards—not just in the Ninth Ward, but all over America.

"While Katrina gave us the opportunity to think creatively about how to make green homes affordable for the low-income families who need them the most, it shouldn't take a hurricane to make that happen in other cities," Pitt told supporters at a meeting of the Clinton Global Initiative in 2009. "Our plan is to take what we have learned in New Orleans and help other communities build healthy, safe, and affordable green homes."

MIR, one of several builders active in the Ninth Ward, has completed 80 houses since it started building in 2008. In November, it broke ground on its latest round of houses, all eight using structural insulated panel (SIP) construction (see "From Sticks to SIPs," p. 54). That SIPs provide the most cost-effective route to MIR's goals is just one of the lessons MIR has applied as it has driven down the cost of its projects from more than $200,000 for the first prototypes to about $150,000 for its latest units. At about $130 per sq. ft., that figure falls within market rates for affordable housing in New Orleans—with the added value of healthful indoor-air quality, sustainable materials, and energy efficiency. According to the organi-

A way out. *All MIR homes provide a roof escape in case of flooding—either a hatch (top photo) or a roof deck (bottom photo), which also can be used for recreation.*

New look, old neighborhood. *Make It Right homes, like the one on the right, are changing the landscape of part of New Orleans' Lower Ninth Ward several lots at a time.*

Photos facing page and bottom right, this page: Linda Reeder

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LESSON LEARNED

FROM STICKS TO SIPs

In its search for the most cost-effective and high-performing building methods, MIR has made it a point to build its homes in several different ways: using advanced framing techniques, factory-built modules, and structural insulated panels (SIPs).

For its stick-framed houses, MIR used metal connectors, aligned framing elements, adhesive, and nails to make its 2x4, 24-in.-on-center framing stronger and more resource efficient than conventionally framed walls. Tested in the wind tunnel at the University of New Orleans, the panels were found to be five times stronger than required by code. The technique also left 7% more space for closed-cell spray-foam insulation, which added to structural strength and provided an air seal in addition to insulation values of about R-6 per in.

The modular approach proved less successful. "The concept makes sense, but there were problems with the particular designs not being realized, and the level of quality was not up to our standards," explains Sarah Howell, project architect with MIR's executive architect, John C. Williams Architects. Designing to LEED Platinum criteria required materials and fixtures not standard for modular-home manufacturers, and difficulty in executing some of the more complicated designs required field modifications. In addition, Howell says, "a lot of modular houses were supposed to arrive 90% complete, and they'd hit the roads in Louisiana and incur a lot of damage."

The winner? For MIR, it's SIPs, which the organization plans to use for all homes going forward. After an initial experiment with steel-faced panels, which proved expensive and difficult to install, the organization turned to OSB-faced panels made by SIPS Team USA in Bainbridge, Ga. Exterior-wall panels have a 16-in. custom extension on the outer piece of OSB that covers the floor system and eliminates the need for a rim board while providing lateral stability. The OSB sheathing is treated to resist moisture and mold. After factoring in local labor costs, material costs, and the availability of local contractors trained in SIP installation, Howell says, "we figured out that for our region at this time, SIPs are the best way to build."

zation, MIR homeowners' annual utility bills average $1068—about half what their neighbors living in conventional homes pay.

From deep despair to high design

While restoring the community is MIR's primary goal, doing so with outstanding sustainable designs set its mission apart from the start. "Brad Pitt is passionate about architecture," says MIR executive director Tom Darden. "It was his idea to reach out to architects all over the world. We got some really amazing designs out of the process." Homeowners can choose from 27 different plans donated by architects across the globe (see "Ninth Ward notebook," below).

The contemporary interpretations of traditional New Orleans home designs have had their critics, some who have claimed that the elevated designs discourage neighborhood unity and others who have argued that the designs stray too far from the vernacular. That's not what MIR architect Sarah Howell hears, though. "I am on the ground in the Lower Ninth Ward, and those kinds of criticisms never come from the residents, who are our clients," says Howell, whose firm, John C. Williams Architects, develops the donated schematic designs into construction documents and provides architectural services during construction. "It's outsider perceptions that are misguided. Our architects spent huge amounts of pro-bono time in the community and always responded to [residents'] criticisms."

To qualify for an MIR home, buyers or their immediate family members must have been living in the Lower Ninth Ward when Katrina hit. Buyers obtain funds from outside mortgage financiers, The Road Home grant program, and other sources. MIR provides additional financing as necessary.

A learning curve for cost control

Thus far, returning residents have selected 12 single-family and four duplex designs from among those available. Each time a design is rebuilt, MIR tweaks the design and construction to improve performance, to lower costs, and to meet the individual homeowner's needs.

"Our goal is to try to always increase the performance and level of green, and then reduce costs. They're conflicting goals," Darden says. "We never want to reduce disaster resilience, quality, or durability. This forces us to think in ways that are new and creative."

To begin, MIR needed a trained workforce. Because MIR homes are built with techniques that are not widely practiced in the region, the organization had to prepare workers. It trained 25 men and women with little previous construction experience through its green training program, and it provided additional training to more than 300 build-

Ninth Ward notebook: A neighborhood reshaped

The 21 firms that submitted designs to Make It Right included architects from Asia, Africa, Europe, and South America; 15 were from the United States, including seven from New Orleans. All were asked to base their designs on traditional New Orleans house types, including town houses, cottages, and shotguns. Designs also had to meet the organization's standards for storm resistance, safety, and sustainability, as well as qualify for LEED Platinum status. Architects responded with a wide range of innovative concepts, many of which were incorporated into actual MIR homes. Here's a selection.

The single-family house designed by Billes Architecture of New Orleans has proved the most popular. In response to the local climate and drawing on traditional architectural elements, the home uses natural ventilation, high ceilings with fans, controlled daylighting, shading devices, and thermal mass to provide comfort with less reliance on mechanical systems.

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A BETTER DRYWALL CHOICE

LESSON LEARNED

In MIR's first houses, fiberglass-faced paperless gypsum board was used throughout, but it was inefficient to work with and costly. MIR found that it could save about 47% on material costs by switching to mold-resistant Gold Bond XP Gypsum Board with Sporgard (www.nationalgypsum.com). The core and face papers of the product are mold resistant, and the face paper wraps around the edges to protect the treated core further.

ing professionals, enabling them to work with solar panels, pervious concrete, advanced framing, SIPs, spray-foam insulation, and the electrical and HVAC systems used in MIR homes.

Priority 1: Built-in storm resistance

Protecting returning residents from future flooding is MIR's first priority. The finished-floor level of each house is elevated 5 ft. or 8 ft. above grade, based on the homeowner's preference. This is higher than the base flood elevation of 3 ft. set by the Federal Emergency Management Agency (FEMA) after the storm. Most houses are elevated 8 ft., with the space under them used for parking or outdoor activities. Foundation construction was one of the first areas where MIR builders discovered they could adjust their methods to save money without sacrificing stability (see "Engineered foundations save money and material," below).

Even without a major flood, storm-water control remains a persistent problem in this low-lying area, which gets an average of 64 in. of rain a year. "The city of New Orleans spends tens of millions of dollars pumping water," says Tim Duggan, landscape architect for MIR, who worked with the organization to create building lots projected to have no storm-water runoff in a 10-year storm event. Sidewalks and driveways are made of pervious paving materials, and every house has precast concrete cisterns that collect 600 gal. of rainwater from rooftops for watering plants and washing cars. Bioswales and rain gardens create planted depressions where storm water can filter into the ground. "It doesn't really cost more," Duggan says. "You just modify grading plans to accept water."

Each house also has a hatch or other escape route to the roof. In the flooding after Katrina, some residents were trapped in their attics; 16 Louisianans drowned this way. While designing for emergency roof access, some architects chose to include roof decks, expanding outdoor living space. "The views of the city are unbelievable," Darden says. "You can see the levee, the canal, downtown—it provides residents with a new perspective on their community."

Local code requires new houses to withstand winds of 130 mph, the top speed of a category 3 hurricane. MIR homes are designed to withstand the 160-mph winds of a category 5 storm. Windows and doors are fitted with tabs to attach hurricane fabric, a hybrid nylon product that is easier to install than plywood in the face of an impending storm (see "Fabric beats glass," p. 56). For durability against ordinary weather, exterior walls on MIR houses are protected with GreenGuard RainDrop building wrap, a rain screen that provides drainage channels and resists air and water infiltration (see "Wrap for durability," p. 57). James Hardie fiber-cement siding was selected for its water resistance, durability, and inert quality.

The storm-resistant features have already been tested. When Hurricane Gustav, a category 2 storm, made landfall here in 2008, the MIR staff was evacuated, and an MIR ware-

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ENGINEERED FOUNDATIONS SAVE MONEY AND MATERIAL

MIR quickly discovered that engineering to the specific structure rather than using prescriptive rules of thumb would prevent overbuilding, particularly with foundations. MIR houses, like many others in New Orleans, sit on concrete piers that rest on pile caps over timber friction piles driven 40 ft. into the clay beneath. By cantilevering the ends of the houses, MIR was able to reduce the number of piers, speeding up construction, cutting concrete requirements in half, and reducing foundation costs by 50%.

Architects were asked to design entries that connected the houses to the streetscape despite their elevation. Wide cast-in-place concrete steps with "stadium seating"—shown in this design by London-based Adjaye Associates—provide one answer. The Adjaye design also features an inverted roof pitch to simplify rainwater collection.

Only one MIR house was not built above base flood elevation—and that's because it was designed to float. Conceived by the architecture firm Morphosis and prefabricated by UCLA architecture students, the home's Saebi Alternative Building System (SABS) foundation is designed to function as a raft. The composite system consists of an expanded polystyrene core sprayed with reinforced concrete. The home's expense and its limited size, however, have made it impractical to replicate.

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FABRIC BEATS GLASS

Window openings on the first four houses were fitted with impact-resistant glass at a cost of about $8000 per house. Switching to conventional windows ($4000 per house) and hurricane fabric ($2000) saved 25%. MIR's initial choice was AstroGuard (www.hurricaneprotection.net), a lightweight, ballistic nylon fabric. Clips attach the fabric to permanently installed anchors. New homes will be protected with a less expensive product from Stormcatcher (www.stormcatcher.com).

house was destroyed. However, none of the six houses built by that time sustained damage.

Engineered for efficiency

Residents select from 13 single-family and 14 duplex designs for their homes, all designed and built to LEED Platinum standards. The first houses constructed were certified to the National Green Building Standard, but dual certification was dropped to save fees. LEED was chosen, Darden said, because it is more widely recognized.

Tight, well-insulated envelopes are common to all MIR homes, whether they are built with SIPs, modules, or advanced framing. Windows are Marvin's pultruded fiberglass Integrity All Ultrex Series, which are Energy Star qualified in the region. Roofs are metal to reflect sunlight and to reduce solar-heat gain, and all homes are equipped with solar panels (see "Saving on solar," facing page).

MIR homes use Verve Living System electric controls from Masco, a system of wireless, battery-free wall switches that harvest their own energy and operate with radio transceivers. Lighting and power receptacles are hardwired to a controller, which is wired to line voltage. Because the wall switches are wireless, the home's wiring can be confined largely to the attic, basement, and bathrooms, saving material and labor costs. This system is a particularly good fit for SIP construction, because no wiring is required in the panels. Vacancy sensors turn off lights in unoccupied rooms and can be tied to a thermostat.

The first MIR homes had ground-source heat pumps, but chronic leaks in the coils led MIR to switch to Unico small-duct high-velocity

Ninth Ward notebook: A neighborhood reshaped *continued*

The sloped design by the New Orleans-based firm Concordia (photo above) is intended to maximize solar collection and to promote passive ventilation. Its floor plan, like that of many MIR houses, reinterprets the traditional shotgun layout in which rooms are arrayed one after another.

The roof of the house designed by Trahan Architects of New Orleans acts as a shading device, rain screen, solar-energy collector, and solar water heater. On the sloping side, the louvers, or "gills," are constructed to act as small gutters, channeling water into a retention system.

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LESSON LEARNED

WRAP FOR DURABILITY

MIR crews initially installed siding over ¾-in. furring strips to create a drainage plane. After six homes, they switched to a rain-screen housewrap, GreenGuard RainDrop, which simplified construction by eliminating the need for jamb extensions and other adjustments. With drainage channels that won't flatten no matter how tightly the cladding is nailed to the wall, the housewrap allows moisture to escape while forming an air- and water-resistive barrier.

HVAC systems. Paired with a 16-SEER heat pump, the high-velocity system's 3-in. ducts employ aspiration to even out temperatures.

A healthful environment for homeowners

Environmental stewardship and homeowner health were addressed with low-toxicity interior finishes that promote good indoor-air quality. Interior products include low- and no-VOC (volatile organic compound) Benjamin Moore paints, no-added-formaldehyde Armstrong cabinets, low-VOC-emitting Shaw carpet, and mold-resistant drywall (see "A better drywall choice," p. 55).

Materials were evaluated using the "cradle-to-cradle" methodology developed by architect William McDonough of William McDonough + Partners, a core member of the MIR team. This approach weighs the environmental impact of a material's life cycle—from its extraction, manufacture, and distribution through its installation and use—and includes its potential for reuse or recycling. The Shaw carpet in MIR homes is one example. This nylon carpet is manufactured with several environmental-stewardship measures in place, is low-emitting, and can be recycled into new carpet when it reaches the end of its life.

Owing to the homes' tight construction, the HVAC system is designed to provide mechanical ventilation while operating. Ventilation is also provided by a fan in the bathroom that runs continuously at 35 cfm. The effect? Since moving into their new homes, three Make It Right residents report that they no longer have asthma. □

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SAVING ON SOLAR

LESSON LEARNED

MIR, which has worked with several different solar suppliers, has seen costs drop by half since the project began, according to product analyst Pierre Moses. Contributing to those savings, he says, was the training of area contractors, as well as the use of metal clips to attach the panels directly to the roofs' metal standing seams. MIR uses S-5 clips by Metal Roof Innovations (www.s-5.com), speeding installation and eliminating costly racks and tilt legs, as well as the need for roof penetrations.

All but one of MIR's house designs have pitched roofs, with most roofs sloping at 30°. Roughly matching the latitude of New Orleans, this slope is ideal for maximizing energy production from photovoltaic panels. The average size of an MIR solar array is 4kw, which Moses says generates upwards of 600kwh a month, reducing electric bills by $60 to $70. Louisiana's generous tax credits and net metering in New Orleans add incentive for homeowners.

While panels on MIR homes are owned by homeowners, the organization has created a separate for-profit entity, Make It Right Solar, that works with nonprofit developers in the area to expand the availability of solar energy to low-income residents. By leasing the solar panels, Make It Right Solar helps to reduce the first costs of solar-panel installations.

Shigeru Ban Architects of Tokyo based its design on a "structural furniture unit" intended to incorporate structure, storage, and insulation needs in a series of prefabricated units. The design is attributed in part to the observation, made in the aftermath of a Japanese earthquake, that the safest places in a house were under furniture or door frames. The model built by MIR was constructed with SIPs.

The house designed by Philadelphia-based Kiernan Timberlake Associates (photo p. 52) has a customizable floor plan built on a standard chassis that can be personalized further through details in the grillwork and the choice of a gable or garden roof.

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