

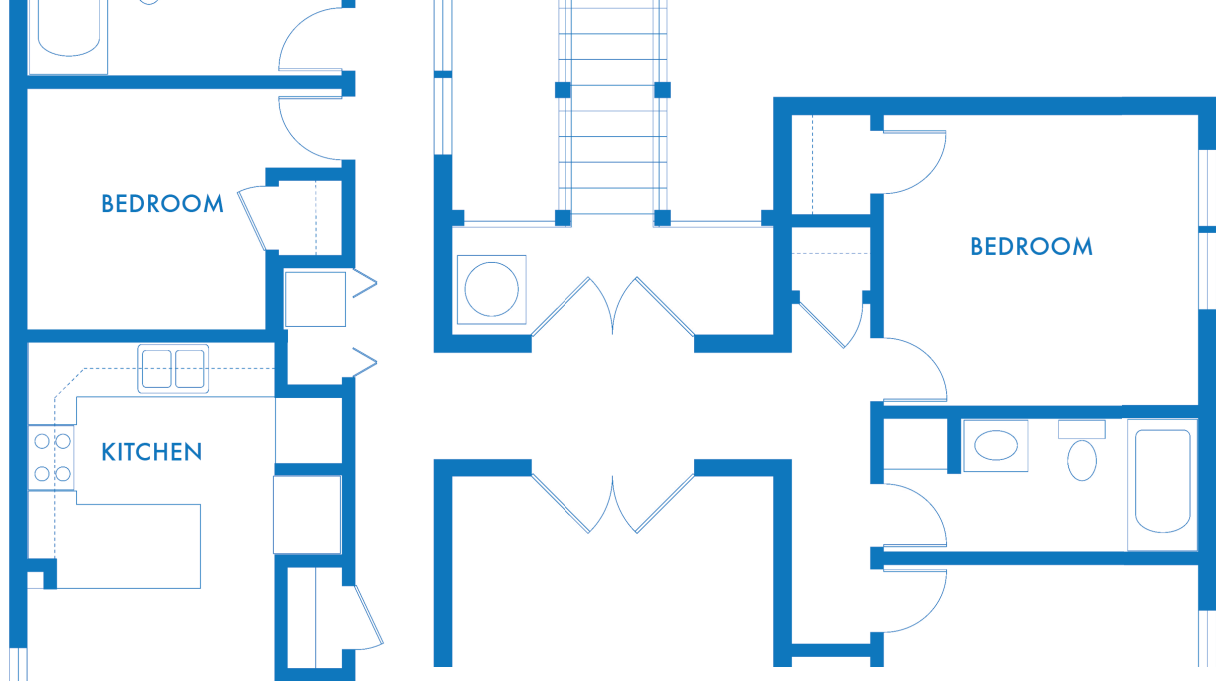


# BILOXI MODEL HOME PROGRAM

Edited by Architecture for Humanity



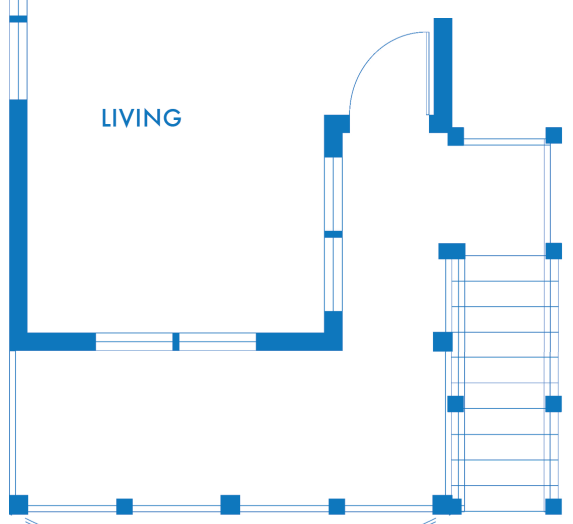





architecture for humanity



**BILOXI MODEL HOME PROGRAM**





**Architecture for Humanity would like to thank** all of the families, architects, engineers, construction professionals, volunteers, supporters, and sponsors of the Biloxi Model Home Program. This book is dedicated to them and to all of the residents of East Biloxi, Mississippi, whose love for their community made this work possible.

**We dedicate this book to engineer Roger Roepke, and to our clients David Desporte and Audrey Robinson who passed away, and to all of those who lost their lives to the storm.**

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# FOREWORD



In August of 2005, the coast was struck by Hurricane Katrina, the largest natural disaster ever known to the United States. Two months before the storm, I was elected to the Biloxi City Council. Immediately after the storm, I formed what is now called the Hope Coordination Center to help the area known as East Biloxi. East Biloxi is the poorest section of Biloxi and was completely decimated by the storm. Three thousand homes were destroyed by the storm and the remaining homes were inundated by flood waters. These were horrible times.

However, as I have said many times, the storm was an opportunity for God to show his great mercy and bring about changes in the area that were sorely needed. East Biloxi received help from hundreds of organizations. Through what I call a divine appointment, I met Kate Stohr, cofounder of Architecture for Humanity. We found common ground and formed a partnership that has lasted to this day. Through Kate's contacts, we were able to obtain a grant from Oprah's Angel Network. The collaboration of these partners and others has facilitated the rebuilding of hundreds of homes in the area. As a part of the grant received from the Oprah's Angel Network, Architecture for Humanity and the Hope Coordination Center were able to look at the many challenges that were facing us. Our biggest obstacles were 1) new height elevations from government regulators, and 2) the challenge of building homes safer, more efficiently, and yet affordably.

Architecture for Humanity rose to the occasion with the Biloxi Model Home Program. The program rebuilt seven new homes at various height elevations and investigated new building design techniques that would make homes stronger and more efficient. Architecture for Humanity also gave a small grant to the Gulf Coast Community Design Studio of Mississippi State University to help create a design studio within our housing recovery center.

There were so many lessons learned from this experiment. Utilizing the new design techniques from the program, the Center has rebuilt 35 homes and currently has about 35 others in various stages of construction. I can honestly say that without the help of Architecture for Humanity, East Biloxi

would be a much more dismal place. We have been able to rehabilitate more than 600 homes in the area with the help of our building and financial partners. The Hope Coordination Center, the Gulf Coast Community Design Studio, and Architecture for Humanity have produced a model for rebuilding after the storm that is now spreading across the Gulf Coast.

## **Bill Stallworth, Hope Coordination Center, July 2008**

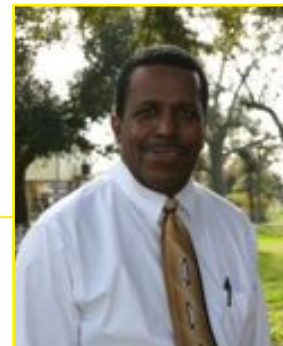


Photo credit: Leslie Schwartz

*Bill Stallworth is a Biloxi city councilman and the executive director of the East Biloxi Coordination, Relief and Redevelopment Agency, now known as the Hope Coordination Center.*



## Oprah's Angel Network

In September 2005, Oprah Winfrey did a show live from the Gulf Coast just days after Hurricane Katrina had destroyed the area. People across the country and around the world saw the devastation and desperate conditions facing those fortunate enough to survive the storm. Oprah made a promise to never forget the families displaced by Hurricane Katrina and committed \$10 million of her own money to build homes and help rebuild lives. And then she invited her viewers to join the effort by contributing their dollars to Oprah's Angel Network. Donations at all levels came pouring in, totaling more than \$15 million.

As the Angel Network looked for ways to make best use of these funds, we made frequent trips to the Gulf Coast and met with many community leaders and volunteer organizations that were struggling to begin their rebuilding efforts amongst all the loss and despair. Nearly every area we visited was still reeling from the devastation, and hope was in short supply.

In October 2005 we drove down Division Street in East Biloxi to meet with Architecture for Humanity and the newly formed East Biloxi Coordination, Relief and Redevelopment Agency (now known as the Hope Coordination Center.) At the time they were working out of a church that had been flooded by the storm and was serving as a makeshift recovery operations center. Color coded maps of East Biloxi were up on the walls, phones were ringing constantly, and there was a steady flow of Vietnamese, African-American, Caucasian, and Latina/Latino people—all residents of the community—coming and going and getting questions answered about how they could begin to rebuild. There was an organized optimism to this chaos that was unlike anything else we had seen in other hurricane impacted areas. It was apparent that something special was in the works that was firmly based in the belief that East Biloxi could be rebuilt.

In the weeks and months that followed we kept in close contact with Kate Stohr, Sherry-Lea Bloodworth, Ben Warnke, David Perkes, and Bill Stallworth as they developed and formalized plans to rebuild in East Biloxi. Their proposal requested \$3.3 million of Angel Network funds to build six model homes and rehabilitate 70 additional homes that had been seriously damaged.

But their proposal went much farther than that: We could see they were

also rebuilding hope in a community that in many ways had been discounted for years prior to the storm.

It's been three years since Hurricane Katrina came ashore. In that time more than 600 severely damaged homes have been rebuilt, thousands of hurricane survivors living in East Biloxi have been helped, and seven model homes now stand as a testament to sustainable design and innovation in the wake of unimaginable devastation.

Oprah's Angel Network is very proud to be involved in these efforts and in the unique partnerships that went into creating them. By supporting Architecture for Humanity, the Gulf Coast Community Design Studio, the Hope Coordination Center, and the countless volunteer groups working in the area, an entire community has been given a voice in how their homes and neighborhoods should be rebuilt. East Biloxi is proof that when residents and organizations work together, communities have the opportunity to come back—sometimes stronger than they were before the storm.

### **Gregg Sherkin, Oprah's Angel Network, July 2008**



Photo credit: Mike Grote

*Gregg Sherkin is a Program Officer for Oprah's Angel Network leading projects throughout the Gulf Coast and South Africa.*

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COORDINATION CENTER

INTRODUCTION

# THE BILOXI MODEL HOME PROGRAM

## Two Years, Seven Homes, and Thousands of New Reasons to Hope

Architecture for Humanity and our partners established the Biloxi Model Home Program in the fall of 2006 as a pilot program to assist residents of East Biloxi in meeting the challenge of rebuilding their city. East Biloxi was one of the hardest hit areas of the Gulf Coast—more than 90 percent of the neighborhood’s housing stock was damaged or destroyed.

In the wake of Hurricane Katrina, many East Biloxi residents feared that new building codes required by the city of Biloxi would dramatically increase the cost of rebuilding by forcing them to elevate their homes, ultimately making it impossible for them to return home. The Biloxi Model Home Program addressed these concerns by inviting architects from around the nation to design and build sustainable, hurricane-resistant, affordable homes that met new construction standards and height elevations required by the city. This forced the program to face full-on the difficult challenges of funding, designing, and constructing an elevated home.

Our efforts with the Biloxi Model Home Program took a long-term view of recovery for the neighborhood of East Biloxi by refining building techniques and improving methods for elevating homes in hurricane-prone communities. The goal of the program was not only to provide design services and financial assistance for the construction of homes but also to test the latest in materials research, disaster mitigation, and sustainable building techniques. The program was a chance to set high standards for new construction in the area and establish a set of best practices that could be used going forward.

The pilot program was unique in that it offered families the opportunity to work one-on-one with architects and design professionals. It approached rebuilding through standardizing design processes, methods, and partnership strategies—as opposed to standardizing a single design. Much effort and time was devoted to creating program materials, from developing family selection guidelines to assisting families in applying for financial aid and preparing contracts. The aim was to enable our partners and others to adopt and adapt the program in the future.

It was our belief that by setting high standards of design and construction we could help families come home and rebuild equity in the community by building back better.



Photo credit: Sun Heratid

### AUGUST

Hurricane Katrina kills an estimated 1.325 million people; more than 1 million people are displaced from the Gulf Coast region. 90% of the buildings along the coast in Biloxi and neighboring Gulfport are destroyed.

### SEPTEMBER

Oprah Winfrey broadcasts live show from the Gulf Coast days after the storm; donates \$10 million of her own money and encourages her audience to donate over \$15 million to Oprah’s Angel Network for relief efforts

### OCTOBER

Architecture for Humanity conducts first on-site assessment of potential partners and projects; partnership with Hope Coordination Center (then EBCRRA), Gulf Coast Community Design, Hands On Gulf Coast and Warnke Community Consultants begins.

## Biloxi Model Home Program Timeline

2005

**Facing page:** Homeowner Karen Parker at the dedication of her home in July 2007.

**This page top:** Program partners and volunteers in spring 2006, in a makeshift space shortly after efforts began. **Bottom:** Program partners and volunteers in fall 2007 with Mississippi Governor Haley Barbour, center, in red polo shirt, outside East Biloxi's Hope Coordination Center.

Photo credit: Architecture for Humanity



Photo credit: Gulf Coast Community Design Studio



I came to Biloxi with a vision of Architecture with a capital "A", to show the world the importance of design, to put my mark on the recovery. I understand now my vision was horribly self-centered, myopic, and misguided. The work and, more importantly, the people I worked with, changed my philosophy on design and the world, and it changed me, all for the better.

This work has come to mean something more important. This work is simply about dignity. Working after a disaster like Katrina, or any other such catastrophe, requires a resetting of values and priorities. The work is to seek out, protect, house, and cherish the dignity you find within community. That's a tricky thing. Easy to say, hard to do. The "design" I have learned is as much about ethics as it is about aesthetics.

This doesn't mean that the heart and spirit of design is lost for a shrewdness of construction. The germination is from a full understanding of the need and the challenge with the project constraints to create a home that is safe, strong and a source of pride. Often the idea of affordability can undermine quality. This work requires a delicate balance, and when that balance is struck the result is an architecture which reflects the aspirations of a community and its people.

**Michael Grote, Program Manger, Biloxi Model Home Program**

**NOVEMBER**

Architecture for Humanity funds Hands on Preservation Workshops conducted by Heritage Conservation Network to train volunteers in historic preservation in repairing homes among other early efforts.

Hands On Gulf Coast creates hundreds of temporary street signs making it easier for volunteers to navigate around Biloxi, speeding up the recovery process.

**2006**

**JANUARY**

Architecture for Humanity provides \$50,000 in seed funding to establish the Gulf Coast Community Design Studio within the Hope Coordination Center.

The Hope Coordination Center (then EBCRRA), GCCDS, and Architecture for Humanity submit a joint proposal to Oprah's Angel Network to support rebuilding in East Biloxi.

# ABOUT EAST BILOXI

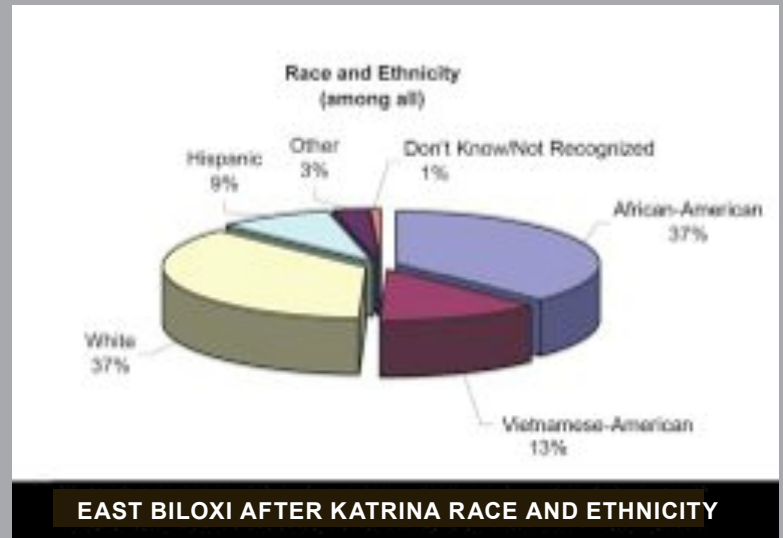
The neighborhood of East Biloxi has a rich and varied history beginning with its settlement in 1699 as part of French Louisiana. Many of East Biloxi's 12,000 pre-Katrina residents had long-standing ties to the community and lived in family homes that had been passed down from generation to generation. Many older Biloxi residents remember the effects of Hurricane Camille, which devastated this area in 1969. Hurricane Katrina was weaker than Camille at landfall, but was a larger and slower-moving storm, leading to a higher storm surge. Unfortunately, many of Biloxi's residents who experienced Camille believed Katrina to be less of a threat.

East Biloxi has always been home to a variety of groups and cultures that make the community unique. The neighborhood contains almost all of the city of Biloxi's landmarks, museums, and tourist attractions, including the Ohr-O'Keefe Museum of Art, the historic downtown civic center, and Mary Mahoney's restaurant, where one can see the flood levels from hurricanes Betsy and Camille marked on the walls.

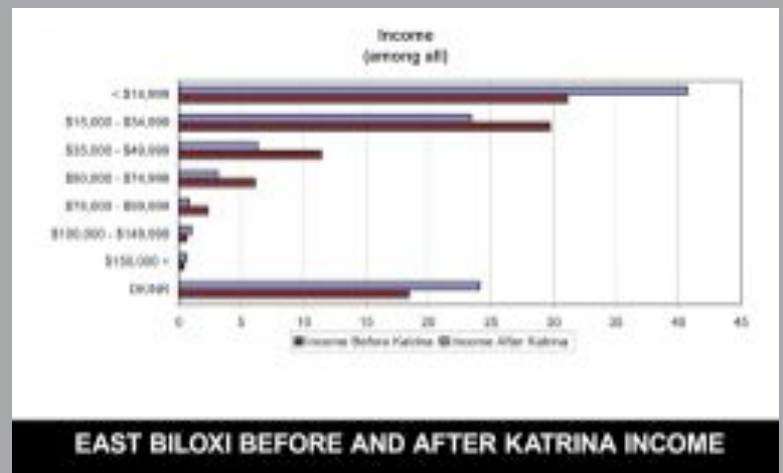
East Biloxi's residents are employed in three main areas: the military, shrimping, and tourism. Most of the tourism jobs are through the local casino industry. The state of Mississippi has the third-highest gaming revenues in the country, behind only Nevada and New Jersey. The vast majority of the gaming revenue earned by the state comes from casinos located along the waterfront in East Biloxi, yet families in the surrounding neighborhoods struggle.

East Biloxi residents suffer from a higher poverty rate than any other area in the city of Biloxi. Twenty-two percent of the households living in the floodplain on the Biloxi peninsula have incomes less than 150 percent of the federal poverty line, and most families live on less than \$26,000 per year. East Biloxi has dealt with issues of crime and drug activity in the past. Even before the devastation of Hurricane Katrina, the neighborhood suffered from a lack of affordable housing and employment opportunities.

In short, as in many other areas along the Gulf Coast, the effects of Hurricane Katrina in East Biloxi exaggerated already difficult social and economic conditions.



**EAST BILOXI AFTER KATRINA RACE AND ETHNICITY**



**EAST BILOXI BEFORE AND AFTER KATRINA INCOME**

## MARCH

Architecture for Humanity brings 60 volunteers to East Biloxi during spring break. OSHA certified trainer provides safety classes and orientation for volunteers. Hope Coordination Center (EBCRRA) begins series of community workshops to solicit input on rebuilding plans as part of a

community-based planning process. Program partners and the GCCDS begin lot-by-lot assessments; 500 surveys filled out by residents allow program partners to better understand local residents' priorities in rebuilding East Biloxi. Case management files at center: 2048

## MAY

The Hope Coordination Center (EBCRRA) and its partners receive \$3 million in funding from Oprah's Angel Network to establish a community loan fund, support the rehab of more than 75 homes, and establish the Biloxi Model Home Program as part of Operation

Restore Hope. Program Manager Michael Grote hired by Architecture for Humanity to lead Model Home Program.

Credit: Hope Coordination Center and Warnke Community Consulting

Credit: Hope Coordination Center and Warnke Community Consulting



Photo credit: Alan Richardson/Architecture for Humanity

**JUNE**

The Hope Coordination Center (EBCRRA), Architecture for Humanity and Oprah's Angel Network meet with Mayor A.J. Holloway to confirm city support for Operation Restore Hope. Community loan fund program and documentation developed for Biloxi Model Home Program and Rehab Program.

**JULY**

Family selection process begins to identify participating families in the Biloxi Model Home Program. Architecture for Humanity invites selected firms to develop concept designs for the Biloxi Model Home Program

**AUGUST**

Participating firms submit schematic designs for the Biloxi Model Home Program. Family selection for the Biloxi Model Home Program completed. Biloxi Model Home Fair launches program. Architecture for Humanity begins Building 101 classes.

**OCTOBER**

First round of Designer/Family meetings for Biloxi Model Home Program; Soils reports & site surveys conducted. Initial architectural, zoning & planning reviews

# AFTER THE HURRICANE

Harrison County, Mississippi, was one of the hardest hit areas on the Gulf Coast, and East Biloxi was one of the hardest hit areas of Harrison County. The storm took 53 lives. In East Biloxi, 3000 homes were destroyed and 4000 more homes were severely damaged. Businesses, schools, churches, and other infrastructure were also destroyed as a result of the storm.

In East Biloxi and throughout the Gulf Coast, Hurricane Katrina had a greater impact on African-Americans, children, the elderly, and the disabled than on other populations. African-Americans made up about 44 percent of all Katrina victims region-wide, and nearly half of all persons age 65 or older living in areas affected by Hurricane Katrina reported a disability.

The damage patterns observed in East Biloxi were typical of other hurricanes, including damage caused by high winds, coastal flooding from storm surge, high-velocity water flows, damaging waves, and intense rainfall. The storm surge waters that flooded East Biloxi were forceful but quickly receded, unlike New Orleans where levee system failures trapped water like a bowl.

Much of the neighborhood's housing stock had been built long before a building code was adopted by the city. Many homes had been battered by previous storms and were poorly maintained. Older construction methods left homes exposed to uplift forces from surging waters, which twisted the homes up off their foundations or in many cases swept them away entirely. Homes that maintained their structural integrity through the surge suffered water damage and mold growth after the waters receded.

After the storm, families managed the best they could, moving in with extended family or staying away entirely until they could receive help. The recovery effort has taken many years. By August 2008, approximately 75 percent of the 2200 standing homes in East Biloxi had been repaired and are occupied. And on the neighborhood's 2500 vacant lots, an estimated 100 to 200 new homes have been built, including the seven homes of the Biloxi Model Home Program. Recovery efforts continue, now three years after the storm.



Photo credit: Architecture for Humanity



Photo credit: Architecture for Humanity

## NOVEMBER

Loan closings conducted; families required to maintain wills to deed estate.

## DECEMBER

Second round of Designer/Family meetings for Biloxi Model Home Program. Engineering consultation meetings. Construction collaboration.

## JANUARY

Construction begins on first home (Parker) Models of Biloxi Model Homes exhibited at re-opening of Ohr-Okeefe Museum

## FEBRUARY - MARCH

Designs finalized for Nguyen and Tran homes designed by MC<sup>2</sup> Architects.

Bids tendered for homes designed by MC<sup>2</sup> Architects



# A UNIQUE COLLABORATION



Photo credits: Gulf Coast Community Design Studio, Leslie Schwartz/Architecture for Humanity

One of the brightest spots in the post-Katrina landscape of East Biloxi is the East Biloxi Coordination Relief and Redevelopment Agency (EBCRRA), now known as the Hope Coordination Center. Established by Biloxi city councilman Bill Stallworth days after Hurricane Katrina, the center began its work by distributing relief supplies. At the same time, Architecture for Humanity began canvassing the areas seeking community groups and local architects with which to partner. In East Biloxi we found both.

Sherry-Lea Bloodworth, a volunteer, happened upon the Hope Coordination Center days after the storm as she helped families evacuate. Two months later, the agency was distributing supplies and had begun organizing volunteer groups by blocks to clear storm debris. This was an innovative approach that was already showing results.

Architecture for Humanity came to visit East Biloxi in October 2005 and invited David Perkes of Mississippi State University School of Architecture, Art + Design to join us. Perkes was working to establish an extension of the university's community design studio on the Gulf Coast to be closer to the recovery effort.

At the time, roads remained impassable, bridges had collapsed, gas stations were closed, and Internet connectivity was nonexistent. Volunteers slept in tents or in their cars. Working toilets, much less a working office or a recovery center, seemed a long way off. Nevertheless, this first meeting led to a rewarding collaboration that has lasted to this day.

With donations from individuals and firms—averaging \$25 to \$75 each—Architecture for Humanity provided seed funding to establish a partnership between the Hope Coordination Center and the Gulf Coast Community Design Studio. Architecture for Humanity also reached out to Warnke Community Consultants to work with the center to support its growth and develop a model for financing the reconstruction that lay ahead. Hands On Gulf Coast generously provided housing for our volunteers.

Together, the four groups worked closely to secure long-term funding that would support not only the Biloxi Model Home Program discussed here but also the repair of hundreds more partially damaged homes.

Today the Hope Coordination Center stands out as a successful model for post-disaster recovery along the Gulf Coast. It is not a stand-alone organization, but a meeting point where key players in the rebuilding effort in East Biloxi, from governmental groups to volunteer organizations to non-profits, meet and come together. With in-house case management and construction management staff, the center acts as a clearinghouse for financial aid and counseling, architectural design and engineering services, and support from volunteer groups, all under one roof.

For the better part of the first two years after the storm, the Hope Coordination Center borrowed space from a church and its staff worked on folding chairs. In April 2007, it moved into permanent space designed by the Gulf Coast Community Design Studio.



In addition to housing Architecture for Humanity and GCCDS staff, the center quickly became a second home to many other groups working in the area. These groups included faith-based volunteer organizations, university groups, Vietnamese support groups, community development organizations, and many others.

Since its inception the Hope Coordination Center has worked with volunteer groups and other partners to undertake a wide range of community renewal efforts from bringing neighbors and volunteers together to remove debris after the storm, to identifying vacant properties, to clearing and revitalizing neighborhood parks.

The Biloxi Model Home Program is just one result of this unique collaboration. It owes its success to the partners listed to the right and to many more who offered assistance and support.

**Above left to right:** The Hope Coordination Center houses the East Biloxi Coordination Relief and Redevelopment Agency (EBCRRA), Gulf Coast Community Design Studio (GCCDS), Architecture for Humanity and others. EBCRRA caseworkers at their desks; The entryway of the Hope Coordination Center; Architecture for Humanity Biloxi Model Home program manager Michael Grote in the design studio; a blackboard designed by GCCDS honors volunteer groups that helped with recovery.

## Biloxi Model Home Program Partners

### Architecture for Humanity

Architecture for Humanity works to build a more sustainable future using the power of design. Through a global network of building professionals, Architecture for Humanity brings design, construction, and development services to communities in need.

### Hope Coordination Center

The mission of the Hope Coordination Center is to support the individuals, families, small businesses, and neighborhoods of East Biloxi, Mississippi, as they rebuild their community in the wake of Hurricane Katrina. The center provided case management and other support to the Biloxi Model Home Program.

### Enterprise Corporation of the Delta (ECD)

ECD, one of the nation's leading community development financial institutions, provides financial products and services in Arkansas, Louisiana, Mississippi, and Tennessee. ECD provided financial counseling to families participating in the program.

### Gulf Coast Community Design Studio

Gulf Coast Community Design Studio is an outreach of Mississippi State University School of Architecture, Art + Design and uses professional faculty and staff to provide design services to communities impacted by Hurricane Katrina. GCCDS partnered closely on the Biloxi Model Home Program, identifying sites and sharing information in addition to collaborating to design two of the homes.

### Hands On Gulf Coast

Hands On Gulf Coast is a volunteer agency that provides opportunities for Gulf Coast residents and people from around the world to participate in the rebuilding effort. Hands On Gulf Coast provided housing for Architecture for Humanity volunteers.

### Warne Community Consulting

Warne Community Consulting designs and implements practical solutions to assist nonprofit organizations in achieving their missions and addressing the challenges confronting the communities they serve. Warne Community Consultants assisted the Hope Coordination Center and its partners by structuring the \$3 million community loan fund that helped finance the Biloxi Model Home Program and the repair and reconstruction of more than 100 other homes in the community.

# EARLY EFFORTS



Photo credits: Architecture for Humanity

The groundwork for rebuilding East Biloxi was laid by many of the nonprofit groups and volunteer groups who came to the region in the immediate wake of the storm. Their work was critical to establishing the Biloxi Model Home Program. Below is a brief summary of some of their efforts and the immediate steps that can and should be taken in the aftermath of large-scale disasters to help residents move from relief to recovery and ultimately reconstruction.

**VOLUNTEER COORDINATION** Capturing volunteer support in the wake of a disaster can help jump-start a recovery effort. In many cases, however, the disaster has by definition left the civic infrastructure of a community as devastated as its physical infrastructure. Community leaders, struggling to address their own immediate needs, have little time to guide volunteers. As a result volunteers duplicate each other's efforts, provide assistance in a haphazard way that does not necessarily result in the neediest people receiving aid, and miss opportunities for economies of scale.

In East Biloxi, the East Biloxi Coordination Relief and Redevelopment

Agency, later known as the Hope Coordination Center, stepped in less than a month after the storm to coordinate activities and make the most of the energy and enthusiasm of volunteer groups. They did this in two critical ways that profoundly affected the recovery effort:

First, they organized weekly meetings of all the volunteer groups in the area, where leaders could exchange information, find areas of cooperation, and share updates about city, state, and federal activities that affected their work. They also shared program information, forms, sources of support, and other information.

Secondly, the center established a grid system of East Biloxi's neighborhoods, assigning a target area on the grid to each of the many relief organizations working in the area. This was a critical early step because it allowed the relief groups to work quickly within the community with a minimum of confusion and overlap. The grid system was also a huge help to the center's caseworkers because they knew exactly to which relief group to refer families who visited the center asking for help.

## NOVEMBER

Remaining three houses under contract negotiation to be signed. Mississippi Development Authority Homeowner Grants arrive. Gulf Coast Community Foundation Mississippi Hurricane Recovery Fund grants begun.

## JANUARY

Parker home completed and family moves in. Ground breaks on Odom and Robinson homes with successful test piles

## FEBRUARY

Odom design finalized and bid for construction. Construction begins on Robinson home.

## MARCH

Roger Roepke, structural engineer with Black Rock Engineering for the Biloxi Model Home Program, visits Biloxi to conduct structural design workshop with GCCDS and EBCRRA staff. Biloxi Model Home program presented at the ASID National conference in New Orleans.

2008



**MAPPING AND WAY-FINDING** One of the first acts of the Gulf Coast Community Design Studio in East Biloxi was to convert the hand drawn grid done by the center into a printable GIS based map. The map circulated widely; copies could not be printed quickly enough.

Another critical early step was undertaken by volunteers from Hands On Gulf Coast. Recognizing that the many volunteers working in the community of East Biloxi were having difficulty finding their way around the city, the group took time out from other relief efforts to put up temporary street signs throughout East Biloxi. This simple act sped the recovery process enormously, allowing volunteers to identify properties, set up meeting locations, and in general, get around the city faster to help more people.

**PLANNING AND ASSESSMENT** Biloxi was the subject of several long term plans created by groups such as the Congress for the New Urbanism, which was invited by Governor Haley Barbour to facilitate a planning workshop for the reconstruction of 11 coastal communities affected by the storm at a state level. Living Cities, based in Washington D.C., provided planning

support to Mayor A. J. Holloway and the City of Biloxi.

These large-scale planning efforts helped secure federal funding for the recovery effort at the state and city level. However, they also caused anxiety and uncertainty among homeowners and local businesses who feared their properties would be claimed by eminent domain. Primarily this was due to the efforts taking place so soon after the storm while families were still grieving and isolated, but it was also because the planning was conducted before more granular level assessments had been made. In effect, they treated the city as a blank slate, whereas in reality, although buildings had been destroyed, property ownership, neighborhood ties, and

**Facing page left:** Program Manager Mike Grote. **Right:** Volunteers planting trees at the Parker Home. **This page left:** Gregg Sherkin from Oprah's Angel Network presenting the Hope Coordination Center and Architecture for Humanity with a funding check. **Right:** Managing Director Kate Stohr hugging Kathy Everard outside Everard's new washhouse built by volunteers.

#### APRIL

Nguyen home completed and family moves in. Desporte home completed and family moves in.

#### OCTOBER

AIA Houston Design Award 2007, Award of Excellence in Design to MC2 Architects for the Nguyen Residence and the Tran Residence. AIA Arkansas Design Award 2007 to Marlon Blackwell for the Tyler Residence.

#### JANUARY

Architecture for Humanity brings 15 volunteers to East Biloxi to work on the Robinson and Odom houses.

#### MARCH - OCTOBER

Robinson, Odom and Tyler homes completed and families moves in.

Remediation and post-occupancy repairs needed & completed on Tran and Robinson homes.

2009

# EARLY EFFORTS



Photo credit: Architecture for Humanity

the other non-physical infrastructure of the city survived the storm intact. The lesson: long-term planning should be conducted by city planners themselves at a later date after assessments have been made and the recovery effort is well underway.

By contrast, block-by-block assessments conducted by volunteer groups provided much needed information, helped prioritize immediate needs, and sped the recovery effort. In the spring of 2006, the center and its partners conducted a resident survey as part of a neighborhood-level planning effort. In addition to asking residents to prioritize their rebuilding goals, it gathered critical data such as whether a property was rented or owner occupied, whether the structure was more than 50 percent damaged and therefore likely to be condemned, homeowner's interest in selling or rebuilding, income, and demographics. This process resulted in various tools, including damage assessment maps, that allowed work to be prioritized and aided family needs assessments by case managers.

**CASE MANAGEMENT** An ongoing struggle for volunteer groups involved case management. Groups working on a regional level maintained case databases as did groups working locally, and state and federal groups. Privacy restrictions prevented these groups from sharing information among them. This slowed the recovery effort. The Coordinated Assistance Network ([www.can.org](http://www.can.org)), formed by seven leading disaster assistance agencies in 2004, created a common platform for collection and sharing case information between agencies. It was eventually adopted by other groups in the area.

In the end, this shared database supported threaded financing from a wide variety of private, state, and local funding sources.

**SAFETY TRAINING** Recognizing that many volunteers came to the area with little disaster recovery or building experience, there was a great need for safety training. In America, the U.S. Occupational Safety and Health Administration provides safety manuals and offers on-site consultation in all states for high risk work areas and can assist volunteer groups in preventing accidents.

Architecture for Humanity worked to address this need by partnering with Sustainable South Bronx to bring an OSHA certified safety trainer to Biloxi in March 2006 when many college volunteers came to the area during the first spring break after the storm. The trainer gave an hour-long safety orientation session to our volunteers before they began work and conducted a longer four-hour safety training class with volunteer crew leaders from other groups. The sessions put safety in the minds of volunteers, but could have better addressed the specific issues found in disaster zones. Major injuries were thankfully avoided.

**DEBRIS REMOVAL AND PROPERTY ACCESS** Through the winter of 2006, volunteer efforts to clear debris in preparation for rehabilitation were in full swing. The City of Biloxi helped speed this effort by committing to remove any debris put curbside free of charge. (By contrast the City of New Orleans would only clear debris from the lot if it was to be condemned and set restrictions on when debris could be removed.) However, neither the city



nor volunteer groups could legally enter private properties to remove debris without the owner's permission. Many homeowners who had fled had still not returned to their properties to give this much needed permission.

To remedy this, volunteer groups canvassed neighborhoods establishing ownership of each property and asking neighbors who had returned to help them connect with those who were still displaced. Each owner was asked to sign a right to access form that enabled volunteers to enter their property. From that point forward, the debris could be moved to the street where the city cleared it.

This work raised a number of environmental concerns, not the least of which was poor air quality. Among other safety precautions that should be taken, waste removal contractors should be required to cover trucks carrying debris.

**MOLD REMEDIATION** Flooding resulted in the growth of mold in many homes, which was aggravated by the area's high humidity level. Homes that had suffered less than 50 percent damage required mold removal before being rehabbed. Mold removal is tedious, tiring, and hazardous, causing allergic reactions and respiratory illness with repeated long-term exposure. Nevertheless, hundreds of volunteers selflessly stepped in to undertake this work.

Mold remediation involved gutting homes to the framing to remove porous materials, including dry wall, from the home. Information on how to remove

mold effectively and safely can be found on the Environmental Protection Agency's website and the Centers for Disease Control website.

Safety gear must be worn, including respiratory protection with full face-piece respirators, with N100, R100, P100 (or for powered air purifying respirators, HEPA) particulate filters; disposable protective clothing covering entire body including both head and shoes; heavy work gloves; heavy work boots.

**BUILDING BASICS** Building back after disaster requires construction management and training. A shortage of experienced volunteers can lead to costly errors, such as drywall being installed prior to inspection. As volunteer groups in Biloxi ramped up to rebuild, Architecture for Humanity staff and design fellows established a Building 101 training program in their off hours to prepare volunteer leaders to oversee crews. Led by Program Manager Mike Grote, and jokingly called Mike's Building Fun Time, the class covered the basics of housing construction, how homes stand up, the basics of mechanical, electrical, and plumbing systems, and why building practices are standardized ("Don't do this or the house will fall down kinds of things," Grote says.) The classes began in late summer 2006 and are still being taught into 2008. The original six-part class series was trimmed to two hour-long sessions. Hundreds of volunteers received training through the program, and program materials are available online at: [www.architectureforhumanity.org/project/building101](http://www.architectureforhumanity.org/project/building101)

**TRANSITIONAL HOUSING** In order to begin rebuilding, the partnering volunteer organizations needed first to find temporary housing for families, many of whom were still living in their damaged homes or on their lots. The need for temporary or transitional housing was great as FEMA trailers took between six months to a year to reach residents. In planning for rebuilding it's necessary to allow time and resources to support the relocation of families into temporary housing. The coordinated efforts of case managers and project managers was required to not only help families to apply for FEMA trailers (which the agency required be sited on owner lots) but also to move or remove the trailers and find alternate housing for families to allow for construction on the site.

**CELEBRATION** Throughout the rebuilding process the Hope Coordination Center and volunteer groups brought community members and volunteers together to celebrate various milestones, from the restoration of a neighborhood park to honoring the commitment of volunteer groups to commemoration the loss of loved ones. Barbecues, song tournaments, t-shirts, ad-hoc get-togethers and more formal celebrations were vital to sustaining hope and fostering collaboration in long-term recovery after major disaster which can last between 5 and 10 years.

**Above left to right:** Volunteers from Hands On Gulf Coast and program manager Mike Grote work on the Nguyen Home, University of Minnesota students build a wheelchair ramp for the D'Orvilles on a spring break building trip, Moldkateers suited up and ready to inspect homes for mold, Painting the interior of a home, Mike Grote leading his Building 101 training workshop.

# REBUILDING REQUIREMENTS AND CHALLENGES

In the aftermath of the storm, families faced many obstacles to rehabbing and rebuilding their homes. Many professionals and groups were eager to help families along the Gulf Coast rebuild their homes and several large scale urban planning studies were initiated. These planning initiatives, however, did not address the questions that residents themselves faced when they returned to their properties and began to untangle the complex rebuilding requirements established by FEMA for assessing the viability of a structure and for determining the elevation requirement for new structures.

Given the obstacles to rebuilding and the inherent risk associated with building in an area susceptible to hurricanes, still others questioned whether or not it made sense to support residents efforts to rebuild on their properties. However, relocating homeowners from their community, their neighborhood, and their homes could be a fatal blow to an already vulnerable community. Yet a relocation program was absent, and so East Biloxi's residents had little choice but to stay.

Families struggled to answer three basic questions:

1. Is it safe to rebuild on my lot?
2. How will the new building codes and flood elevations affect me?
3. If I rebuild, what can I afford to rebuild?

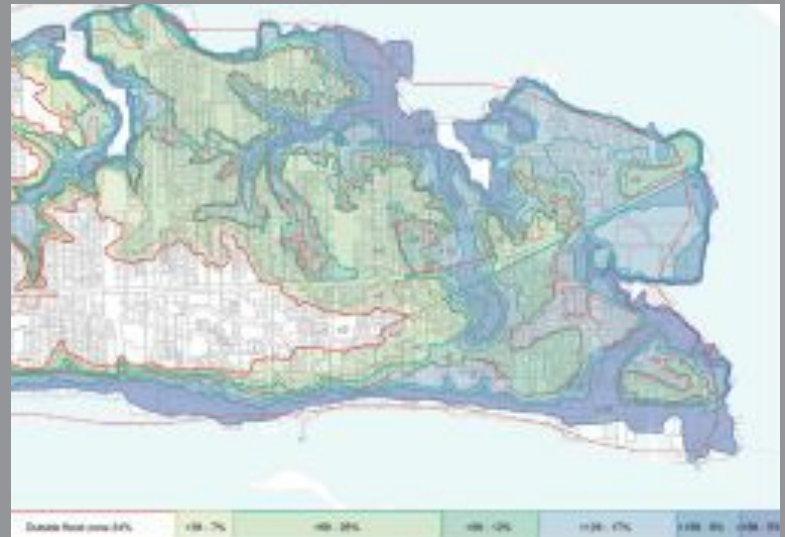
The single biggest hurdle to rebuilding East Biloxi was money. Federal and state reimbursements were applied slowly and erratically and involved complicated rules and applications. A significant proportion of homeowners in Biloxi were under insured or uninsured against what insurers call "water-driven" (versus wind-driven) damage. For the most part, families who had inherited their properties owned their homes outright. Because they did not hold a mortgage on the property, many did not carry flood insurance, a requirement of mortgages on properties in flood zones. Furthermore, many homeowners discovered that due to spiking property values, labor costs, and the price of materials, insurance policies purchased before the storm did not cover the full cost of the damage to their homes. Even with the variety of public and private financial assistance available, thousands of families faced a gap between what they could afford and the cost of construction.

Equally daunting for families wanting to rebuild were the new building standards, including flood elevation levels proposed by the Federal Emergency Management Agency (FEMA) for the City of Biloxi, to prevent damage in future storms. These new requirements underwent constant change for years following the storm, making it difficult for residents to access information relevant to them and making it difficult to progress with design and construction with confidence.

FEMA requires homeowners in flood zones to rebuild elevated homes and to participate in the National Flood Insurance Program. After Hurricane Katrina, FEMA proposed new Advisory Base Flood Elevations (ABFE) for the City of Biloxi which were considerably higher than the original 1984 Base Flood Elevations (BFE) for Biloxi. Under the new ABFE regulations, the entire neighborhood of East Biloxi was now designated a flood zone,

meaning that all rebuilt homes would need to be elevated. How high a home needed to be elevated depended on where the home fell on the ABFE map. Every foot of additional elevation meant additional costs. All of the Biloxi model homes were built to the more stringent ABFE levels to ensure that our families would meet requirements for inclusion in the National Flood Insurance Program.

To succeed in helping residents rebuild, all of these obstacles would need to be overcome. Going beyond code to design not just homes but a program to meet the eligibility mandates of aid organizations, insurance requirements and affordability constraints of our clients became our mandate.








## The National Flood Insurance Program

FEMA introduced the National Flood Insurance Program in the late 1960's, and the program now includes nearly 20,000 communities across the United States and its territories. This program is aimed at reducing the escalating costs of repairing damage to buildings and their contents caused by floods by requiring communities to implement floodplain management plans, enabling property owners to purchase flood insurance, and by creating construction standards to mitigate the effects of flooding.

In the wake of Hurricane Katrina, many funders required families to participate in the National Flood Insurance Program to receive financial aid. This meant that they needed to meet the building requirements of the program, which in turn meant elevating their homes.

# FACTORS FOR REBUILDING

DAMAGE		FLOOD		
		UNDER 50% DAMAGE	OVER 50% DAMAGE	NEW HOUSE
IN FLOOD ZONE	NOW			
	WHEN FLOOD MAP CHANGES			
OUT FLOOD ZONE	NOW			
	WHEN FLOOD MAP CHANGES			

Credit: Sarah Rowden, re-drawn from Gulf Coast Community Design Studio

**Facing page left:** A map developed by the GCCDS illustrates how high new homes in East Biloxi must be elevated to meet new Advisory Base Flood Elevation levels. Rebuilt homes in East Biloxi needed to elevate from 3 to 15 feet to meet new requirements. **Above:** A diagram developed by the GCCDS helps homeowners understand how the amount of damage to their home and the home's location will impact their rebuilding efforts.

# FINANCING A REBUILD

East Biloxi families seeking help to rebuild their homes faced many financial hurdles that prevented them from accessing aid despite the billions of dollars of financial assistance flowing into the area. Many funders, seeking to minimize their risk and maximize their impact, restricted their funding to “unmet needs” or provided grants of materials rather than cash. This meant that families could access certain types of financial aid only if they had already begun to rebuild. The refrain: “No, no, you give first...”

In response to this financial catch-22, Architecture for Humanity enlisted the help of Warnke Community Consultants and Enterprise Corporation of the Delta to create a financing model that would enable families to begin rebuilding while they applied for other financial aid.

The solution was a revolving community loan fund. Revolving loan funds are pools of money lent or granted to community members for economic development. They are generally managed at a local level. As the loans are repaid, or “recaptured,” the funds are made available for new loans to community members. Typically revolving loan funds are used in developing countries where access to capital is limited. In this case, we adapted the model to support the rebuilding effort in East Biloxi.

Here’s how it worked: Families received a loan, however, there was no interest charged on the loan and families were not required to make loan payments. Instead, a lien was placed on the property. If homeowners sold their home within five years, the loan would be recaptured at the time of the sale. Each year that homeowners remained in the house thereafter a portion of the loan would be forgiven. If they stayed in the home for 10 years or more, the entire loan would be forgiven.

These “forgivable loans,” also called “recoverable grants,” covered the entire cost of construction. In this way the loans allowed families to begin rebuilding while they applied for financial assistance from other sources (see chart, right), and because the funding was structured as a loan instead of a grant, families were still eligible for other types of assistance.

Later, as money was released to families from private and federal assistance programs, loan funds could be recaptured and returned to the revolving fund. The lien triggered notices to us whenever a family was approved for state or federal aid allowing us to recapture the loan. A program participation agreement stipulated that if a family received financial aid from another source, the family would be required to return those funds to the program to help repay the original loan. Persuading families that the “loan” was more like a grant took some thought. Case managers stopped calling it a “forgivable loan,” and called it a “no-pay” loan instead. This turn of phrase helped families understand how the loan affected them. To ensure that family members living in the home were not penalized if the owner passed away, we required families to keep a current will.

The revolving loan fund was seeded with a \$3 million grant from Oprah’s Angel Network. Part of the fund supported new construction, including the Model Homes; the rest funded the rehab of partially damaged homes.

## Loan Funds Recaptured Through Financial Aid

	Material Grants (In-Kind)	American Red Cross (Cash)	MDA I (Cash)	MDA II (Cash)	MDA Elevation (Cash)	Total Funds
Home 1	\$36,745	\$13,524				<b>\$50,269</b>
Home 2	\$19,625	\$20,000	\$37,820		pending	<b>\$77,445</b>
Home 3	\$19,076		\$20,000			<b>\$39,076</b>
Home 4	\$19,594	\$20,000	\$53,904			<b>\$93,498</b>
Home 5	\$29,082	\$20,000		\$33,812*	pending	<b>\$82,894</b>
Home 6	\$37,870	\$20,000	\$14,000			<b>\$71,870</b>
Home 7	\$35,998	\$18,854	\$88,914		pending	<b>\$143,766</b>
<b>Total</b>	<b>\$197,990</b>	<b>\$112,378</b>	<b>\$214,638</b>	<b>\$33,812</b>		<b>\$558,818</b>

\*Homeowner did not repay program

Financial assistance was coupled with design services and construction management to enable homeowners to take advantage of materials grants and volunteer labor. And program documents used to establish the revolving loan fund were shared freely to support larger rebuilding efforts along the Gulf Coast.

The approach was not hurdle-free. Federal financial aid programs administered by the Mississippi Development Authority (MDA) took up to two years and in some cases longer to make its way to families. Most families in East Biloxi did not qualify for phase 1 of the MDA’s Homeowner Grant Program. Although more families qualified for phase 2 of the program, which had fewer restrictions, families waited a long time for their applications to be processed. Statewide, as of mid-July 2008, nearly 70% of families in the state’s Homeowner Grant Program were still waiting for their phase 2 funds.

These delays had serious implications for our program. As construction costs escalated, it took longer to recapitalize the loan fund. This slowed our work and forced us to find other sources of funding to subsidize the construction of the homes. Also, because the various grant programs of the MDA were directed to homeowners only, and because homeowners had to meet a number of requirements to qualify, organizations such as the Hope Coordination Center were forced to approach the rebuilding effort household by household rather than block by block.

When homeowners did receive further financial aid, from either the MDA or from private sources, many were understandably reluctant to use the funds to repay the lien on their homes to recapitalize the revolving loan fund. In part, this was because families feared they would not have funds to purchase appliances or furniture. When possible we responded by releasing a portion of the funds to provide a furniture grant to the families.

GRANTS	Timetable	Amount	Purpose	Notes	Source
<b>EMERGENCY GRANT</b>	Weeks after the storm.	Approximately \$5,000 per family	Covers emergency rental housing costs and immediate home repairs (roofs, mold infestation).	Funds provide limited support and are typically used for relocation expenses, mortgage payments, food, shelter, clothing, personal necessities and are less often put toward repairs.	Federal Emergency Management Agency, Enterprise Corporation of the Delta, other non-profits
<b>MATERIALS GRANT and VOLUNTEER LABOR</b>	Months after the storm through the present.	Varied, up to approximately \$10,000	Allows families to purchase materials needed to rehab and rebuild their homes.	Homeowners unsure of which materials to buy to rebuild need professional advice. Materials were obtained through a sponsoring nonprofit group, which purchased materials on behalf of the family and complicated the process. Material grants lend themselves to a volunteer labor pool rather than free market construction services as typically general contractors purchase materials.	Salvation Army, Gulf Coast Community Foundation
<b>UNMET NEEDS GRANT and GAP FINANCING</b>	End of first or second year after the storm.	Approximately \$10,000	Helps families who have begun to rebuild finish needed work.	Homeowners apply through case managers to qualify. Aid comes in the form of grants or low/no interest loans. Funds were intended to bridge the gap after families had begun construction with funds received from state and federal sources, but most families received government aid after the fact.	Red Cross and other nonprofit organizations
<b>FEDERAL DISASTER RECOVERY FUNDS (Mississippi Homeowner Assistance Program)</b>	Two years after the storm through the present.	Averaging \$110,000 in general but between \$30,000 and \$60,000 for Architecture for Humanity clients	Covers part of the cost of rebuilding.	When families are rebuilding their homes, they must have the majority of the needed funds in hand to begin construction. As a result, although these federal and state grants represented a significant portion of the construction budget, processing delays of more than a year dramatically slowed the recovery effort. To qualify for Phase 1 funding families had to live outside of the flood zone, demonstrate owner occupancy, and carry homeowner insurance. For Phase 2 families needed to live within the flood zone. These requirements disqualified most East Biloxi applicants.	Federally earmarked funds administered by Mississippi Development Authority

# THE BILOXI MODEL HOME FAIR



Photo credit: Tracy Nelson/Architecture for Humanity

Work began in earnest on the Biloxi Model Home Program nearly a year after the storm hit ground.

We began identifying prospective families in the summer of 2006 and surveying possible home rebuilding sites in East Biloxi. The family selection process for the program was rigorous and helped to establish standards for providing services based on need. Caseworkers at the Hope Coordination Center created a pool of potential clients from door-to-door surveys within the community. More than 100 lots were initially investigated for property owner information, lot status before the storm, primary residence, and ability to contact the property owner. Households were ranked by need. Families living in FEMA trailers on their lots were given precedence. A review panel consisting of community members on the center's board of directors and representatives of each partnering organization selected five primary families and two alternatives to participate in the program in a blind review process ensuring fairness and preventing favoritism.

We debated whether or not to choose and develop designs for the two alternative families, without the funding in place to build their homes. In the end we erred on the side of hope; at a minimum, these families would receive design services. Having alternatives left the program open to building more homes if more funding became available. If we encountered insurmountable obstacles on one project, we would not have to backtrack to the earlier selection stage of the program and begin the design process anew with another family while other homes were

already in construction. (Family selection guides and tools, including forms, evaluation guidelines, and selection procedures can be downloaded from [www.openarchitecturenetwork.org/Biloxi](http://www.openarchitecturenetwork.org/Biloxi)).

With the family selection process underway, we worked to recruit architects to participate in the program. Rather than supporting a competition, which requires a long lead time, we invited architects with housing experience to submit concept designs. Research volunteers with Architecture for Humanity identified a short-list of twelve potential firms: four national firms, six regional firms and two local firms. Recognizing the diversity of East Biloxi, we worked to ensure that the firms selected were equally diverse and made sure to include Vietnamese speaking architects given the large Vietnamese community in East Biloxi. To our surprise, all agreed to participate.

In August 2006, we brought each firm to Biloxi to participate in the Biloxi Model Home Fair and launch the program. The Salvation Army generously lent us space in their aid distribution center for the day. To attract residents, we set up a hot dog stand and gave away "Hot Dogs for Humanity." Children were invited to design their dream home with paper and crayons and using Google SketchUp, a 3-D modeling program, which was projected on one wall of the space for all to enjoy.



## Participating Architecture Firms

Brett Zamore Design  
Houston, TX

buildingstudio  
Memphis, TN

Guild Hardy Architects, PA  
Biloxi, MS

Gulf Coast Community Design Studio  
Biloxi, MS

Huff + Gooden Architects  
Charleston, SC

JBHM Architects, PA  
Biloxi and Jackson, MS

Marlon Blackwell Architect  
Fayetteville, AR

CP+D Workshop  
Charlottesville, VA

Chung Nguyen of MC<sup>2</sup> Architects  
Houston, TX

PHATT Collaborative  
Miami, FL

ROCKHILL and ASSOCIATES  
Lecompton, KS

STUDIO GANG ARCHITECTS  
Chicago, IL

**“It was like an architectural flea market. We were hustled into a tent, this big disaster tent, and set up at tables, and the public and the families all came. We were really having to sing for our supper, answering questions about the wind, how’s it going to stand up... We made it fun. We joked, ‘Okay, now, this is called the PorchDog house. If you pick this one, it comes with a porch dog.’ And they’d laugh and go back to us, ‘I got two of those already!’ So it was fun.”** Marlon Blackwell, architect

**“We were hawking our wares, hoping somebody would pick us... The thing that impressed me was how candid people were. I don’t think I’d experienced that before.”** Ray Huff, architect

The model home fair invited all local residents to view new designs for elevated homes. **Left:** Architect Marlon Blackwell reviews his design for the PorchDog house with future client Richard Tyler and his son Zarek, **Left top:** Participating architects gather after the fair. **Left bottom:** Architect Chung Nguyen explains his design to the Nguyen family. **Centre:** Elevation maps and home designs by the GCCDS. **Right top:** Models by Huff+Gooden Architects on display. **Right bottom:** A can of green beans borrowed from the Salvation Army props up presentation boards. **Right:** Maurice Cox of CP+D Workshop shares his design.

“PEOPLE SAY, ‘WHAT KIND OF  
THEM, ‘THIS IS A GOOD HOUS  
IT’S A MIRACLE; IT’S A BLESS  
—KAREN PARKER, HOMEOWN

HOUSE IS THIS?' AND I TELL  
E—A GOOD, STURDY HOUSE.  
ING. THAT'S WHAT IT IS.”  
ER

HOME STUDIES

# THE BILOXI MODEL HOMES



## Parker Home

Brett Zamore Design  
Houston, Texas

4 Bedroom, 2 Bath, 1415 sq. ft.

Advisory Base Flood Elevation (ABFE): 18 feet (7 feet above grade)

Foundation: Treated wood columns on concrete piers on continuous footing

Structure: 2x6 wood infill framing between columns, roof trusses

Materials: HardiePlank siding, bamboo flooring, Galvalume panel roof

Zoning: RS-5 single family residential

Lot dimensions: 105' frontage x 100' deep

Setbacks: 20' front, 5' side, 25' rear

Notable for: Adaptable, modular system, potential for in-law expansion, minimal cutting of standard wood members, minimal waste

Standardized Construction Cost: \$145,000; \$102 per sq. ft.



## Nguyen Home

Chung Nguyen, MC<sup>2</sup> Architects  
Houston, Texas

4 Bedroom, 3 Bath, 2046 sq. ft.

ABFE: 19 feet (10 feet above grade)

Foundation: Concrete pier on spread footing with wood columns

Structure: 2x6 wood framing, 2x6 tongue-and-groove decking and finish floor diagonally laid, roof trusses

Materials: HardiePlank siding, 2x6 tongue and groove finish floor, aluminum windows, 30-year architectural shingles

Zoning: RS-5 single family residential

Lot dimensions: 100' frontage x 210' deep

Setbacks: 20' front, 5' side, 25' rear

Notable for: Design focused upon existing oak tree canopy as a social gathering space and an outdoor kitchen

Standardized Construction Cost: \$155,500; \$76 per sq. ft.



## Tran Home

Chung Nguyen, MC<sup>2</sup> Architects  
Houston, Texas

3 Bedroom, 2 Bath, 1750 sq. ft.

ABFE: 19 feet (10 feet above grade)

Foundation: Treated wood columns on concrete piers on spread footing

Structure: 2x6 stud framing between columns, roof trusses, 2x6 tongue-and-groove decking

Materials: HardiePlank siding, Energy Star windows, 2x6 tongue-and-groove finish floor

Zoning: B-2 community business

Lot dimensions: 50' frontage x 113' deep

Setbacks: 25' front, 5' east, 12.5' west, 10' rear

Notable for: Maximizing space on a small lot; \$65/sq. ft. construction costs; large, wraparound porch for socializing with neighbors inspired by homeowner's self-built FEMA trailer deck system.

Standardized Construction Cost: \$119,650; \$68 per sq. ft.

### Standardized Construction

**Cost:** Calculated based on standard industry material and labor cost to match design intent. For actual construction cost, including donation of materials, see each home profile.



Credit: CP+D Workshop

## Desporte Home

CP+D Workshop  
Charlottesville, Virginia

3 Bedroom, 2 Bath, 1400 sq. ft.

ABFE: 19 feet (10 feet above grade)

Foundation: Driven pile

Structure: 2x6 wood framing,  
engineered wood floor system

Materials: HardiePlank siding,  
Energy Star windows, bamboo  
flooring, soy-based spray foam  
insulation, Galvalume panel roof

Zoning: RS-5 single family  
residential

Lot dimensions: 50' frontage  
x 112' deep

Setbacks: 20' front, 5' side, 25' rear

Notable for: Creative integration of  
wheelchair accessibility throughout,  
including a ramp system; passive  
cooling; rainwater harvesting;  
integration of house and landscape

Standardized Construction Cost:  
\$149,200; \$107 per sq. ft.



Credit: Studio Gang Architects

## Odom Home

Studio Gang Architects  
Chicago, Illinois

Gulf Coast Community Design  
Studio, Biloxi, MS

3 Bedroom, 2 Bath, 1400 sq. ft.

ABFE: 20 feet (13 feet above grade)

Foundation: Treated wood driven pile

Structure: 2x4 wood framing,  
prefab wood trusses

Materials: HardiePlank siding,  
Energy Star windows, soy-based  
spray foam insulation, engineered  
wood flooring

Zoning: RS-5 single family  
residential

Lot dimensions: 50' frontage  
x 124' deep

Setbacks: 20' front, 5' side, 25' rear

Notable for: Pinecone inspira-  
tion, connection between indoors  
and out, passive cooling using  
breezeways, screened porches and  
windows for cross ventilation

Standardized Construction Cost:  
\$145,175; \$89 per sq. ft.



Credit: Huff & Gooden Architects

## Robinson Home

Huff & Gooden Architects  
Charleston, South Carolina

3 Bedroom, 2 Bath, 1600 sq. ft.

ABFE: 18 feet (5 feet above grade)

Foundation: Treated wood driven pile

Structure: 2x6 wood framing

Materials: HardiePlank siding,  
clerestory polycarbonate windows,  
soy-based spray foam insulation,  
aluminum windows, bamboo floor-  
ing, Galvalume metal roof & siding

Zoning: RS-5 single family  
residential

Lot dimensions: 67' frontage x  
135' deep

Setbacks: 20' front, 5' side, 25' rear

Notable for: Hurricane-resistant  
clerestory windows that allow  
ample daylighting to main living  
areas; the home also has a driven  
pile foundation with 2"x6" wood  
stud framing and a shallow sloped  
metal roof

Standardized Construction Cost:  
\$159,500; \$98 per sq. ft.



Credit: Marlon Blackwell Architect

## Tyler Home

Marlon Blackwell Architect  
Fayetteville, Arkansas

3 Bedroom, 2 Bath, 1500 sq. ft.

ABFE: 19 feet (10 feet above grade)

Foundation: Steel frame on  
concrete foundation

Structure: Wood framing on steel  
frame, wood floor trusses

Materials: Galvalume metal siding,  
Energy Star windows, soy-based  
spray foam insulation, bamboo  
flooring, metal hurricane shutter  
system, steel frame

Zoning: RS-5 single family  
residential

Lot dimensions: 57' frontage x  
45' deep

Setbacks: 20' front, 5' side, 25' rear

Notable for: Porch concept flexibly  
integrating privacy and publicity  
between house and street; steel  
frame construction and steel siding,  
shutter design; two-story living area

Standardized Construction Cost:  
\$197,000; \$132 per sq. ft.

# ARCHITECTURAL PROBLEM SOLVING

Typically, architects begin designing in response to the needs of a specific client and a chosen site. In an effort to increase the scalability and applicability of the design proposals, Architecture for Humanity inverted this typical design process. With the help of local building officials and team members on the ground, we developed a median of criteria around which to design. Two sample sites were chosen along with three possible family scenarios sampled from demographic surveys conducted after the storm. In addition, each home design was restricted to less than 1600 square feet, with total construction costs less than \$110,000. This challenge to designers meant that homes had to be affordable, safe, and most of all, adaptable and responsive to social and contextual specificities of a unidentified future client and site. Each architectural firm that participated in the model home fair had to propose a design for each of the two sites and clearly demonstrate how their designs thoughtfully adapted to each of the three family scenarios. After being selected by a family, architects had the opportunity to rework the design in collaboration with their client. This unique design delivery model took time but produced affordable, sustainable, and reproducible designs, even as they catered to the needs of individual households.

In addition to the challenge of contextual sensitivity and adaptability, all designs faced a strict host of regulatory, environmental, and financial constraints, and most importantly, the sensitivity of redesigning homes that embraced existing cultural and neighborhood values.

Regulations in Biloxi were in flux, as new flood research and coastal construction research constantly reworked regulations. Throughout East Biloxi, these new codes required that homes be built stronger and safer than ever before. All new homes had to be elevated from flooding, in some areas more than 12 feet off the ground. New designs were forced to address the

**Below:** Site A and Site B, two typical building sites in East Biloxi. These sample sites were provided to participating architects to use as they developed their design concept.

Photo credit: Architecture for Humanity

complexities of shear, uplift, weathering, erosion, ventilation, window protection, and accessibility. New FEMA regulations reclassified East Biloxi's properties as either Coastal (V) or Inland (A). Coastal V properties, subject to flooding and waves, were forced to meet additional engineering criteria. Properties in the A category were still subject to severe flooding, but not coastal wave forces. This required that many homes be designed to not only withstand hurricane winds of 140mph but also hurricane wave forces.

Designs were also required to address the complex tropical coastal climate of East Biloxi. The home designs had to balance the vital necessities of shade, fresh ventilation, quality daylighting, moisture, and extreme weather protection for decades to come.

How would elevating a home 12 feet off the ground affect the neighborhood streetscape, its vital porch culture, and the crucial interconnectedness of East Biloxi blocks? How would new designs make homes accessible for the wheelchair-bound? The elderly? What about affordability, and ease of maintenance over time? What about changes in family size, or the addition of an in-law unit? Designers were challenged to be sensitive to these social factors as part of the design criteria. Architects and families worked together to translate design constraints into design opportunities, and in turn, each of these homes emerges with creativity, collaboration, and a lasting social, contextual ingenuity.

## DESIGN REQUIREMENTS

**We asked the participating design teams to consider the following in developing designs for the program.**

**A SENSE OF COMMUNITY** East Biloxi is a tight knit community despite its diversity. The desire to keep this sense of community was galvanized in the wake of Hurricane Katrina. The challenge of adhering to the BFE's and keeping a sense of community and neighborhood fabric is a major issue that should be explored and resolved. Please see The East Biloxi Community Plan and the FEMA BFE and Flood Plain Insurance guidelines. (For an



overview of the FEMA BFE and Flood Plain Insurance guidelines please refer to the Home Builder's Guide to Coastal Construction Technical Fact Sheet.)

**AFFORDABLE HOUSING** East Biloxi's need for affordable housing is vital to the recovery and revitalization of East Biloxi, especially after the storm.

**ACCESSIBILITY** One of East Biloxi's major demographic groups is the elderly. The necessity of homes to accommodate the needs of the elderly to age in place should be taken into consideration in the design of the model homes. If your design is selected by an elderly applicant, you may be required to meet Fair Housing Guidelines for accessibility.

**SKILLED LABOR** Biloxi, as with all the areas affected, is in the midst of a construction boom. The larger construction projects in the area, such as casino construction and large high-rise condominium projects have tapped the skilled labor in the region. As a result, communities such as East Biloxi are currently relying on volunteer groups and a mix of skilled and unskilled labor to reconstruct homes.

**ECONOMIC GROWTH** There are any number of opportunities to aid the economic growth and support the long-term revitalization of East Biloxi by building beyond the immediate needs of the client. We encourage you to think about these opportunities. For example, the combination of many fixed incomes & low income homeowners with the high demand for affordable housing offers opportunities to design in property value and revenue generating opportunities for many homeowners with no other options for supplemental income (e.g. "granny flats," "rental units/rooms," etc.)

Creating a flexible plan that can adapt to the changing generations and demographics moving into the neighborhood also presents an opportunity to add value to the property over time.

**LANDSCAPE** Finally, landscape design should also be an integral part of the concept, especially in the cases of high elevation differences from grade to finished floor.

## SAMPLE SITES

**SITE A** Lot size is 50' x 170' oriented on an east/west axis in the longer direction  
Street fronts the eastern lot line  
Zoned RS-5 by the city of Biloxi  
Setbacks: 20' front, 5' side, 25' rear  
Zoned AE by National Flood Insurance Program and FEMA  
Base Flood Elevation (BFE) is 6' above grade. (The elevation of the first habitable floor may be no less than 6' above grade.)  
Typically, sites with a BFE near 6' are in neighborhoods with existing homes that survived Hurricane Katrina but sustained severe damage.

**SITE B** Lot size is 50' x 170' oriented on an east/west axis in the longer direction  
Street fronts the eastern lot line  
Zoned RS-5 by the city of Biloxi  
Setbacks: 20' front, 5' side, 25' rear  
Zoned AE by National Flood Insurance Program and FEMA  
Base Flood Elevation (BFE) is 12' above grade. (The elevation of the first habitable floor may be no less than 12' above grade.)  
Typically, sites with a BFE at 12' exist in neighborhoods that have experienced near complete destruction as a result of Hurricane Katrina.

**TYPICAL CLIENT SCENARIOS** An elderly female/male resident living alone, A married couple with four children, An extended family with two or more unmarried adults and two children

**REGULATORY CRITERIA** National Flood Insurance Program (NFIP), Special Flood Hazard Area (SFHA), Base Flood Elevations (BFEs) and Advisory Base Flood Elevations (ABFEs), FEMA V-zone or A-zone (coastal or inland flooding scenarios), International Building Code 2003, ICC Energy Code 2003, SSTD 10-99 Hurricane Building Code, 1999, including specifications for bracing, strapping, and nail patterns

**OTHER REQUIREMENTS** The habitable square footage of the home should not exceed 1600 sq. ft.

**CONSTRUCTION COSTS** The construction budget for each home will be \$110,000. This includes all hard and soft costs, except design fees.



## The Parker Family

Karen Parker is a single mother of six. Her oldest two daughters are in school at nearby universities, while her youngest four are busy with their middle school and high school sports teams. Karen has worked in the field of early childhood education at Keesler Air Base for more than 20 years. Karen was renting a house in East Biloxi and was in the process of moving into her late grandfather's home and transferring the deed into her name when the home was destroyed by Hurricane Katrina. This unfortunate accident of timing made her ineligible for state financial aid as she could not prove she was an owner occupant of the house when Katrina struck.

## The Design

The Blox is a long, narrow, rectilinear wood frame structure inspired by two Southern prototypes: the shotgun and the dogtrot. Constructed from standard wood members and common construction materials with a minimum of cutting, the Blox is a flexible kit of parts that can be customized easily to the particular needs of a family. Just as a train can be assembled by adding or removing individual cars, a Blox house can be planned by choosing the right elements to meet the space needs of its residents. The basic Blox module is 16-feet wide and is elevated above flood-hazard levels on two rows of wood piers, placed at 12-foot intervals along the outer length. The main module contains the kitchen, dining, and living areas, plus bedrooms for Karen and her younger sons, while across a covered walkway in the studio unit are two bedrooms for Karen's daughters.

The narrow and linear aspect of the Blox House and its component porches allow the Parker family to experience a more direct relationship to their natural surroundings. Even with the height-above-grade requirements, outdoor living spaces on porches and regularly spaced windows along the length of corridors afford constant views to private gardens, play areas, and public streets.

The simplicity of the house in its shape is reminiscent of the many typologies of homes that line the Gulf Coast. Its modern modesty fits right into the East Biloxi landscape.

## IN THE ARCHITECT'S WORDS

**HAZARD MITIGATION FEATURES** The home is engineered to withstand hurricane-force winds up to 140 mph. Two rows of 6x6 wood columns that are anchored to concrete piers 24 inches above grade are placed at 8-foot intervals along the outer length of the structures and run vertically through the entire structure of the house up to the roof. The exterior of the home is streamlined to afford protection from storm winds. There are no roof overhangs, which protect from possible uplift. Roof trusses, designed for the unique steep roof pitch, also protect the home from interior pressure and uplift. Windows are modestly sized to allow for plywood blinds.

**AFFORDABILITY** At a cost of \$137 per square foot, the Parker home's affordability lies in the simplicity of wood frame construction and the modest finishes. The simple diagram of its section allows for a repetitive construction process from start to finish. The home is designed around

**“The actual process was challenging—you learn so much. It's full-on; they involve you. I learned how they constructed it and why, from the foundation to the roof.”** Karen Parker, homeowner



Credit: Brett Zamore Design

modest, off-the-shelf materials: two types of roof trusses, three types of standard-size windows, two door sizes and standard cabinets. As an option for long-term affordability, the studio unit has the potential to convert to a rental for additional income.

**SUSTAINABILITY** Roof trusses and floor beams are prefabricated off-site and then shipped to the site, minimizing waste. Galvanized roofing was selected for its longevity and also to reflect the harsh heat of the summer. Windows promote cross-ventilation and allow the home-owner to regulate light and circulation. The underside of the home is insulated with soy-based foam insulation, providing insulation and a vapor barrier against the subfloor. The prefab cabinets throughout the house do not contain formaldehyde, and the bathroom tiles are a green material.

# PARKER HOME



# PARKER HOME PLAN



Credit: Brett Zamore Design

## The Construction Process

This house was the first to go into construction after the storm. We opted for volunteer labor to save time and money, but the use of volunteers did not come without challenges. Scheduling was a major hurdle—contractors found it difficult to oversee volunteer schedules, and the labor force availability and skill level changed week to week. The level of sophistication of many of the designs also proved to be a challenge to the use of volunteer labor. Coordinating a timeline for donated construction materials was difficult as well.

## What We Learned

The slope of the roof and the related interior vaulted ceiling added a premium to the cost of construction. We chose a screw-down metal roof to get the most from the premium paid to roof at the required slope, an atypical 16-over-12 pitch. The interior 12-over-12 slope and 13-foot ceilings created a dramatic and important vaulted space in the main living spaces, but also meant a higher cost for installing the interior drywall. Some interior spaces called for 8-foot doors—a custom-made item that we paid a premium for. Slight changes to the pitch of the roof and the addition of transoms over standard-size doors could make the design more affordable while maintaining ceiling height for cooling the home and the striking visual appeal of tall entrances and ceilings.

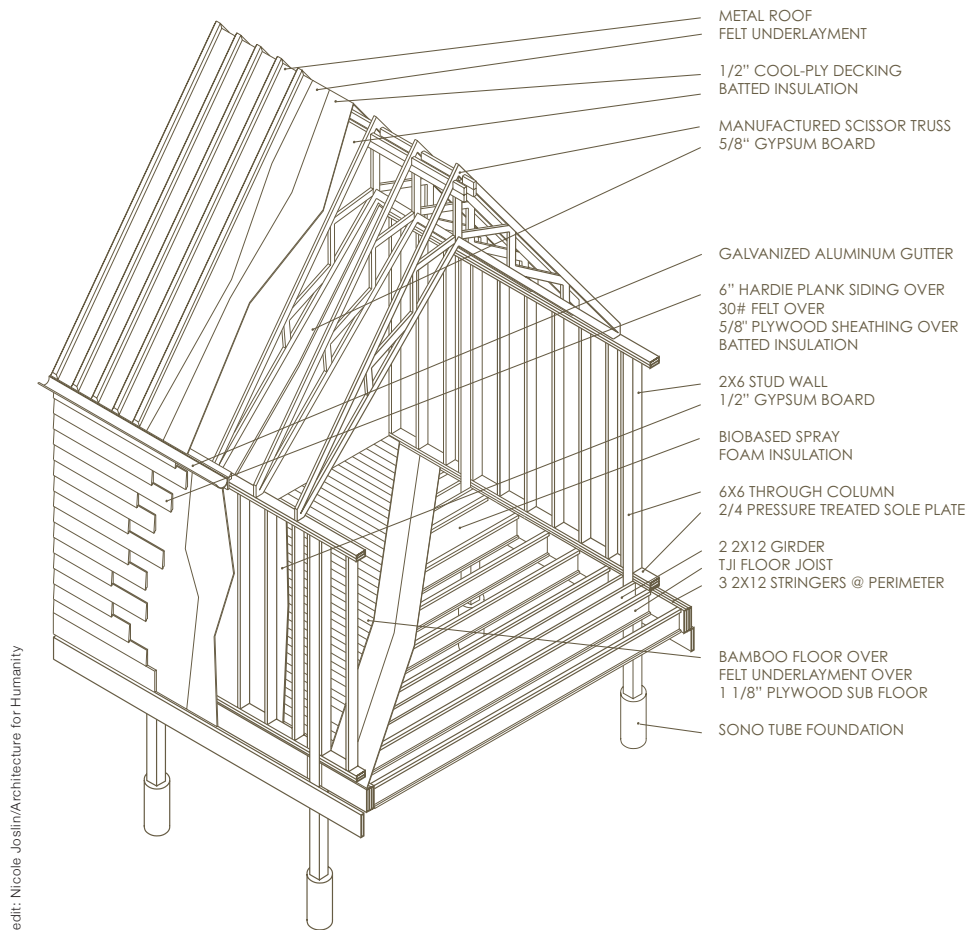


Photo credit: Leslie Schwartz/Architecture for Humanity



Photo credit: Architecture for Humanity

**“Karen’s main concern during the design process was the narrowness of the home: 16 feet. She didn’t want to feel as if she was living in a FEMA trailer. Living in a space that was 10 feet wide for over two years had been painful. I promised her this wouldn’t be the case.”** Brett Zamore, designer



## Parker Home Details

Architect: Brett Zamore Design  
Houston, Texas

Brett Zamore began his training as an undergrad at Yale University (1994) and received his Masters of Architecture at Rice University School of Architecture (1999). Brett has worked for the offices of Michael Maltzan Architecture in Los Angeles and Carlos Jimenez Studio in Houston, Texas. In 2003, Brett established Brett Zamore Design. [www.brettzamore.com](http://www.brettzamore.com)

Engineer: Carlos A. Gutierrez, PE,  
CSF-PE Service Consulting Engineers  
[www.csfengineers.com](http://www.csfengineers.com)

Contractors: Volunteer labor

Landscape designer: Brett Zamore Design

Square feet: 1415

ABFE: 18 feet [7 feet above grade]

Actual Costs:

Hard cost (labor and materials): \$124,685

Material donations: \$52,350

Construction total: \$177,035; \$125 per sq. ft.

Standardized Costs:

\$145,000; \$102 per sq. ft.







## The Nguyen Family

Upon returning home after the hurricane evacuation, Cong Nguyen, a shrimp boat mechanic, found that his house had floated 50 feet away and into the middle of their street. In their new home, the Nguyen family most desired space to grow and room to breathe. Cong and his wife, Oanh Luong, have four teenage children: three boys, Danh, Phu, and Qui; and one girl, Bach Yen. For two and a half years after the storm, Cong and his family cooked meals outside in a makeshift kitchen because the FEMA trailer the family had was too small and got too hot.

## The Design

The new Nguyen residence is a shifted, double bungalow arranged to embrace the existing oak tree located in the center of the property. It was under this tree that Cong cooked egg rolls and shrimp fried rice for more than 30 team members from Architecture for Humanity and MC<sup>2</sup> Architects during their first site visit. The design of the new Nguyen home puts that beloved oak at the center of a large back porch, outdoor kitchen area, and vegetable garden. The family will continue to grow much of their own food on the property.

The home is organized into two sleeping bungalows connected by a living room, dining room, and kitchen. The front bungalow houses the master bedroom and master bath, while the back bungalow contains three bedrooms and two baths for the children. The kitchen opens both to the dining room and the back porch, which rings the oak tree and is large enough to be a room in itself. The Nguyens can simply slide the kitchen doors open and carry the food directly outside. The family looks forward to enjoying family dinners on the back deck underneath the oak tree for years to come.



Credit: MC<sup>2</sup> Architects

## IN THE ARCHITECT'S WORDS

**HAZARD MITIGATION FEATURES** The two homes designed by Chung Nguyen of MC<sup>2</sup> Architects, the Nguyen home and the Tran home, are more resistant to hurricanes than traditional wood frame houses. They are engineered to withstand 140 mph winds and are raised 9 feet above grade to meet FEMA regulations. Metal clips and hurricane straps are specified at every truss, column, and wall to resist uplift during strong winds, and the homes' plywood sheathing is nailed using the nail pattern recommended by FEMA regulations.

**“We were the only Vietnamese architects in the group. The families needed our help understanding the program, putting their trust in the program. I don’t think the Vietnamese families in East Biloxi expected this kind of help. There was definitely a level of comfort that these two families shared with us.”** Chung Nguyen, architect

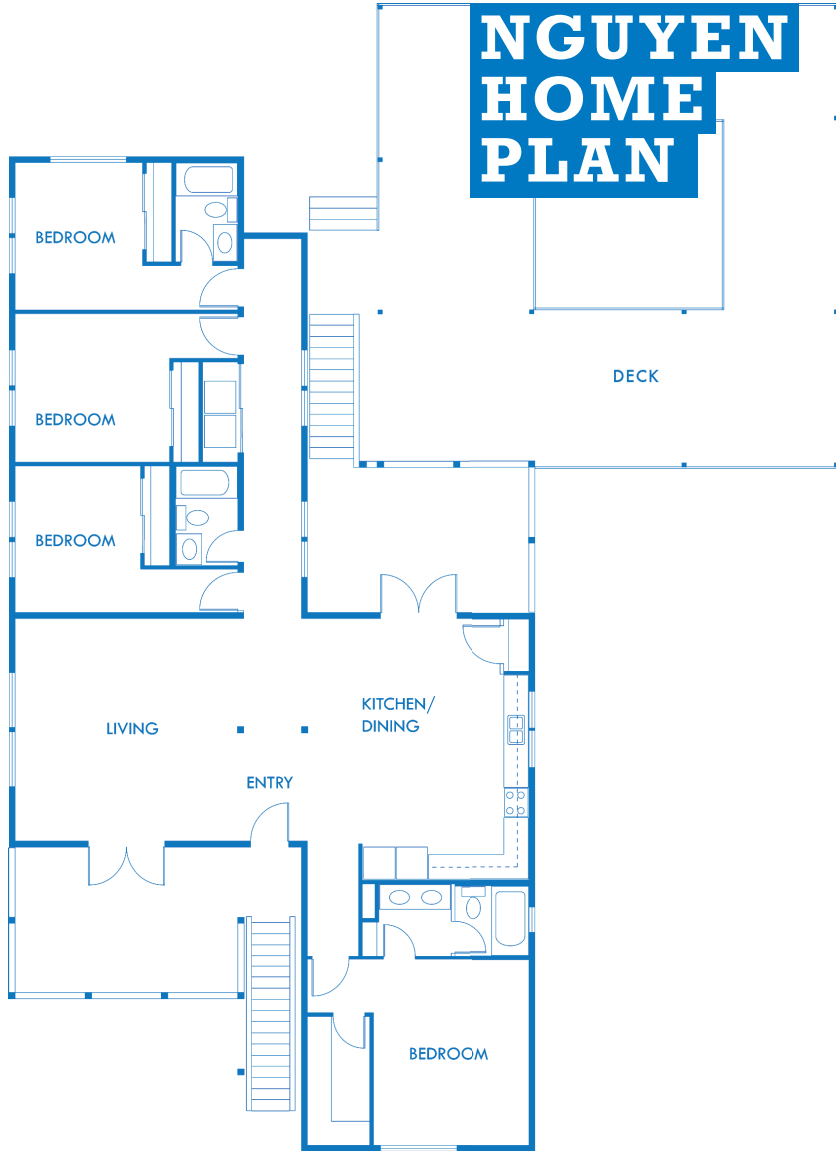
**AFFORDABILITY** Both the Nguyen and the Tran homes cost less than \$89 per square foot with help from generous donations. The homes use off-the-shelf members and other materials that are locally available, and streamline traditional wood framing techniques, cutting labor costs. The structure of the homes is designed as a modular system that can be installed as a kit of parts. The kit of parts members can be mass-produced or repeated. Finally, the homes use a 2”x6” tongue-and-groove subfloor as the finished floor, saving time and material.

**SUSTAINABILITY** The homes use passive solar design principles proven by past vernacular examples. Windows encourage cross ventilation and minimize the use of air conditioning while offering good security. Low-maintenance, durable HardiePlank siding is used throughout the homes.



# NGUYEN HOME

# NGUYEN HOME PLAN



Credit: MC<sup>2</sup> Architects

## The Construction Process

This was the first project put out to bid with a general contractor. This structural system is similar to that of the Parker home, except it uses a 6'x6' spread footing for each pedestal. Through soils testing, we learned the soils here were naturally wet and had a much smaller bearing capacity. As a fix, we poured mud slabs using a 3500 psi pea gravel and slurry mix; then, the next day, set steel reinforcing bars and poured the footings and pedestals.

The structural system has treated 6 x 6 columns on a 12'x18' bay, which continue through to the top plate of the stud wall. This column system is emphasized by the exterior siding treatment, which on the 12' bay side allows for the installation of a 1 x piece of trim at each column. This makes the infill siding very clean and easy, as there is little to no cutting of the siding material and there are no butt joints. A unique feature to the structural system is the use of 2x6 (tongue-and-groove) floor decking in lieu of 3/4" plywood/oriented strand board (OSB). Not only is this a stronger material but it can also serve as the finished floor. The premium paid to replace plywood/OSB for this subfloor is made up for by not purchasing and installing a finish floor material.

## What We Learned

Chung Nguyen of MC<sup>2</sup> Architects has developed a very viable, affordable model for construction and did not lose architectural spirit in the process. Two small detail modifications would make the design of this home replicable in many parts of the Gulf Coast region: 1) a driven pile system, which would have been a more affordable system to deal with the soil conditions and the shallow water table at the home site, and 2) changing to the order in which one builds the main floor beams and girders.



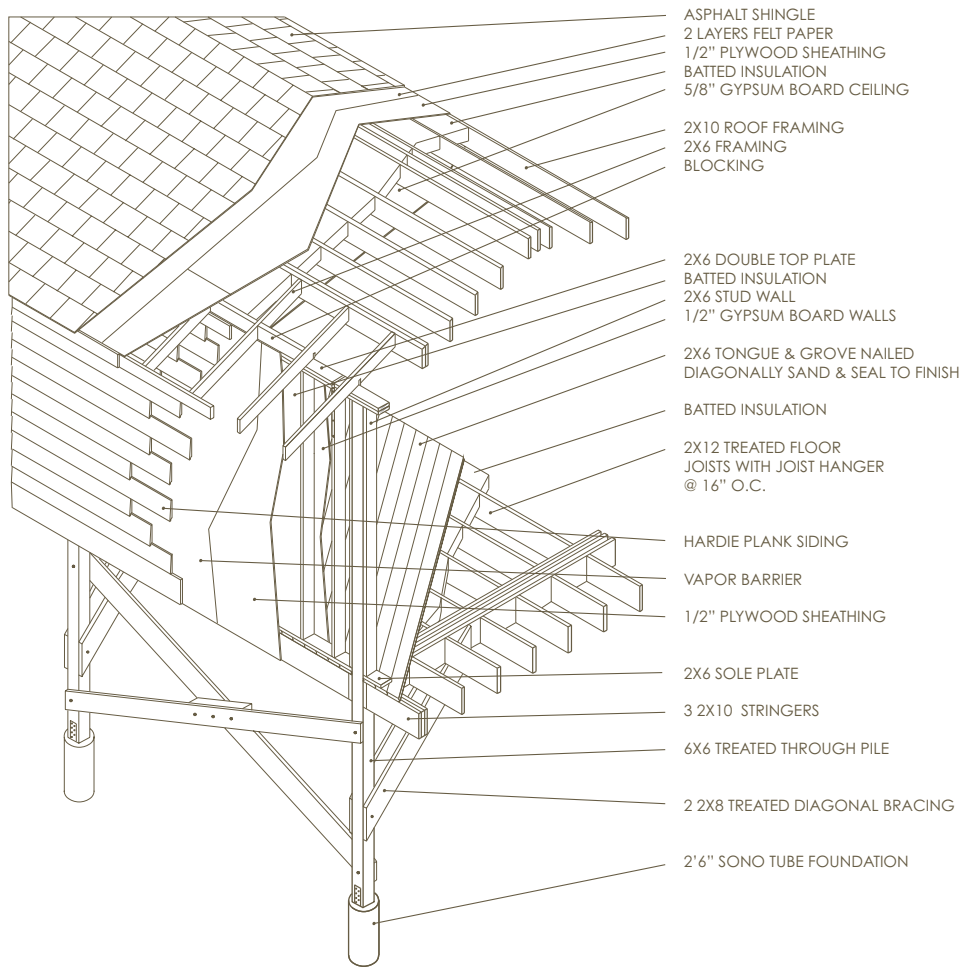
Photo credit: Architecture for Humanity



Photo credit: Architecture for Humanity

**“The home is designed for cooking outside and eating outside. Cong’s outdoor kitchen has the whole works. He can deep fry, he can do everything he wants to do, everything he can do inside.”** Chung Nguyen, architect

Credit: Nicole Joslin/Architecture for Humanity



## Nguyen Home Details

Architects: MC<sup>2</sup> Architects  
Houston, Texas, Chung Nguyen, Chuong Nguyen, Jason Logan, Joe Kellner

The Nguyen brothers, Chuong Q.B. and Chung Q.B., were born in Saigon, Vietnam in 1961 and 1962. During the years following their formal education, the brothers worked and traveled throughout the U.S., Europe, and Asia. In 1997, Chuong and Chung created their design-build firm MC<sup>2</sup> Architects in Houston, Texas. [www.MC2Architects.com](http://www.MC2Architects.com)

Engineer: Carlos A. Gutierrez, PE,  
CSF-PE Service Consulting Engineers  
[www.csfengineers.com](http://www.csfengineers.com)

Contractors: House Calls Construction Co.

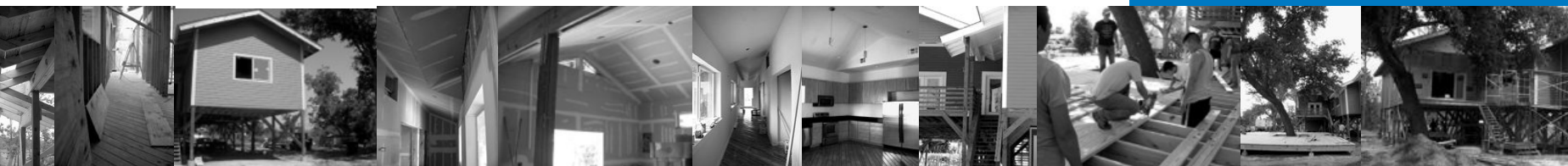
Landscape architect: Paul Hendershot Design  
[www.paulhendershotdesign.com](http://www.paulhendershotdesign.com)

Square feet: 2046

ABFE: 19 feet (10 feet above grade)

Actual Cost:  
Hard cost (labor and materials): \$145,940  
Material donations: \$35,670  
Construction total: \$181,610; \$89 per sq. ft.

Standardized Costs:  
\$155,500; \$76 per sq. ft.







## The Tran Family

Hiep Tran and his wife Lang Tho Do, both in their mid 60s, immigrated to the United States from Vietnam under the Humanitarian Operation Program, helping families of veterans who fought on the American side during the Vietnam War. Hiep and Lang have lived in Biloxi for more than 10 years and had just paid off their mortgage when Hurricane Katrina destroyed their home. They were due to retire in late 2005, but Katrina changed those plans; the couple has returned to work in the shrimping industry to help pay for new expenses due to the storm. The Trans have grown children in the area who may at times live at home with their parents.

## The Design

The Tran property is a small corner lot that measures 50'x100' with a 25' setback in the front and smaller setbacks around the other perimeters, leaving only a small buildable area. To fit the constraints of the site, the architects designed a single long bungalow made up of two modules. The home's front module contains the living room, dining room and kitchen, while the back sleeping module contains three bedrooms, two baths, and a small utility room. Diagonally-laid tongue-and-groove floors throughout strengthen the structure and saved on construction costs.

After the storm, Hiep had collected hurricane debris from the surrounding neighborhood to build a large porch alongside his FEMA trailer, which doubled the family's space for cooking and other chores. Inspired by his resourcefulness, the architects designed a large porch wrapping around the entire southwest corner of the house. The new L-shaped porch faces both the south and west streets and is shaded by a large and welcoming magnolia tree that survived the storm. The porch not only provides much-needed shade but will also allow the Trans to relax in the breeze and interact with their neighbors.

For the architects, the most difficult part of the design process was dealing with the shortage of labor. "The casinos get all of the subcontractors, rather than the family housing projects," says Chung Nguyen. Another hurdle to overcome was the distance from the design offices to the construction site. "We wish we were closer to learn from our mistakes and help make the process more efficient. Even so we traveled to Biloxi six or seven

times during the construction," says Nguyen. Negotiating local building requirements required a lot of collaboration with Architecture for Humanity staff. "The best thing about Architecture for Humanity is that they were able to cut through the red tape and make the connections with the local government. That was all in place for us, so we could focus on what we do best with the design," explains Nguyen.

Getting to know the Nguyen and Tran families and helping them home was a life-changing process for the architects. "My view of architecture has changed quite a bit since the program," says Chung Nguyen. "It's the emotional part of it—you know that you can make a difference. With all of the lessons that we've learned, we hope that these two homes can serve as a model for the future development of Biloxi."

**"Thank you to Architecture for Humanity. East Biloxi residents [need] Architecture for Humanity to make a better life, to make it different in the community." Hiep Tran, homeowner**



Credit: MC² Architects



# TRANN HOME

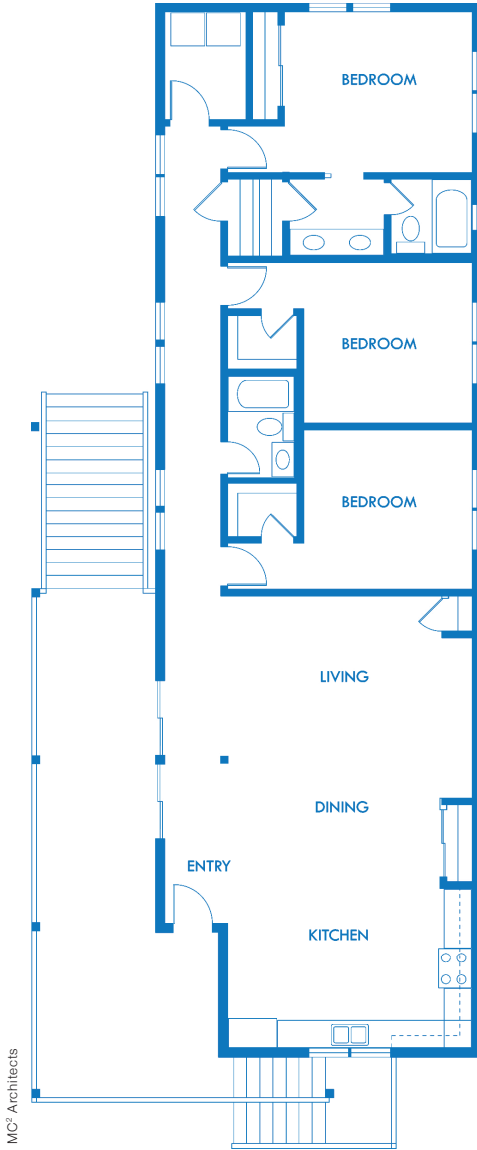
# TRAN HOME PLAN

## The Construction Process

The Tran house suffered from major delays due to a handful of factors, including poor, wet soil conditions for driving piles (similar to problems encountered at the nearby Nguyen home) and scheduling issues with the contractor. The local contractor, a neighborhood community member who also lost his home in the storm, was contracted to build both the Nguyen and Tran homes. After suffering long delays, we faced the difficult question of whether to try to replace this contractor on the project. In the end, Architecture for Humanity's program manager didn't see a large upside to removing the contractor from the project, instead we stepped in to help manage the remaining work and available funds to prevent further delays.

## What We Learned

The importance of asking more questions at the outset in order to better plan for and understand our contractor's schedule was an important lesson, particularly when multiple projects were running concurrently with the same contracting team. The Tran home benefited from lessons learned on the Nguyen project, as the two homes are similar in detailing and overall construction process. The delays experienced had little to do with the design, and we feel the simplicity of this home has the potential to make for a very replicable model for affordable housing along the Gulf Coast.



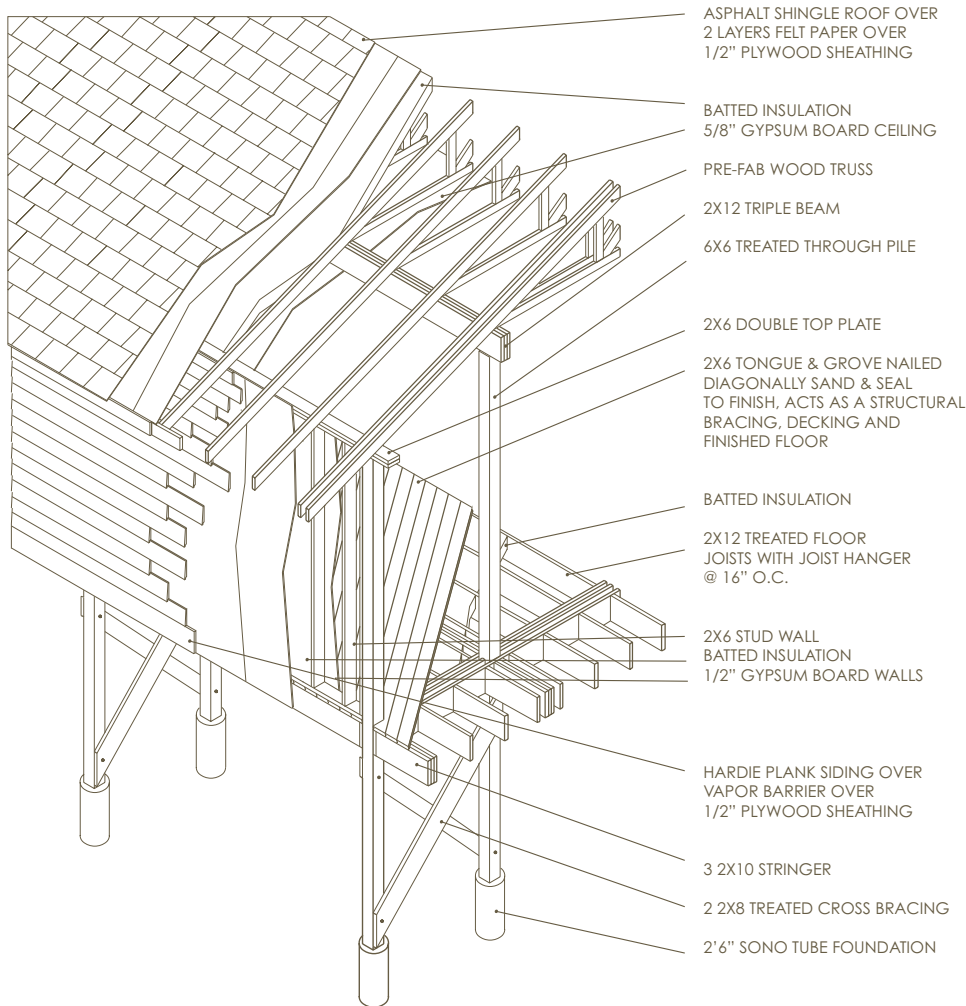
Credit: MC² Architects

Photo credit: Leslie Schwartz/Architecture for Humanity



Photo credit: Architecture for Humanity

**“Our approach was to use design to solve problems in the long term. FEMA is not very flexible. When you’re small and you work on this scale, you can be nimble.”** Chung Nguyen, architect



Credit: Nicole Joslin/Architecture for Humanity

## Tran Home Details

Architects: MC<sup>2</sup> Architects  
Houston, Texas, Chung Nguyen, Chuong Nguyen, Jason Logan, Joe Kellner

The Nguyen brothers, Chuong Q.B. and Chung Q.B., were born in Saigon, Vietnam in 1961 and 1962. During the years following their formal education, the brothers worked and traveled throughout the U.S., Europe, and Asia. In 1997, Chuong and Chung created their design-build firm MC<sup>2</sup> Architects in Houston, Texas. [www.MC2Architects.com](http://www.MC2Architects.com)

Engineer: Carlos A. Gutierrez, PE,  
CSF-PE Service Consulting Engineers  
[www.csfengineers.com](http://www.csfengineers.com)

Contractors: House Calls Construction Co., 228-436-9030

Landscape architect: Paul Hendershot Design, [www.paulhendershotdesign.com](http://www.paulhendershotdesign.com)

Square feet: 1750

ABFE: 19 feet (10 feet above grade)

Actual Costs:

Hard cost (labor and materials): \$111,925

Material donations: \$25,270

Construction total: \$137,195; \$78 per sq. ft.

Standardized Costs:

\$119,650; \$68 per sq. ft.







## The Desporte Family

The Desportes have longstanding ties to East Biloxi. Despite husband David's worsening congestive heart failure, he managed to stay active playing music for his church and enjoying time with his many children and grandchildren in the area. Since the storm, the family has gone through a lot. Through it all, David's only concern was to see that his wife Jeanette had the home she deserved. David reached this goal and was able to move into his completed home just two days before he passed away in April of 2008. Jeanette now lives in her home with her daughter and granddaughter. Nearby family members visit often.

## The Design

This project demonstrates how the demands of wheelchair accessibility and the new FEMA construction standards can be integrated into the design of new homes in the traditional neighborhoods of East Biloxi. It meets the challenge of entering a residence at an elevation of 10 feet by creating a ramp that gently takes one up and through the site to the main living level above. CP+D Workshop partnered closely with Gulf Coast Community Design Studio to refine the design.

The house is shaped by this movement into the elevated living space. The ramp moves up through the center of the house, an unusual solution that creates a dynamic and accessible path for both able-bodied and wheelchair-bound residents. An adjacent screened stair meets the elevated screened porch. The screened stair/porch ventilates through a clerestory screen opening and can be opened into the house with interior windows, providing fresh air movement. The ramp and stair activate an open ground level porch underneath the living area. The floor of the raised terrace is made of steel grating to allow both rain and filtered sunlight onto the ground for a shade garden. The kitchen, living room, and bedroom open out onto the terrace. The L-shaped roof collects rainwater, which is stored in an elevated cistern to provide gardening water. Perhaps most importantly, a 300ft<sup>2</sup> accessory living area has been integrated into the main home, providing the opportunity for possible rental income at a later time.

**“My home has got to be the most beautiful thing you’ve ever seen! It’s different for my neighborhood, but it’s beautiful. It’s long and it has a lot of windows... It’s got a washer and dryer and two more bedrooms—and you go up 10 feet to get inside!”** Jeanette Desporte, homeowner



Credit: CP + D Workshop

## IN THE ARCHITECT'S WORDS

**HAZARD MITIGATION FEATURES** The Desporte Ramp-House is designed to respond to FEMA's new flood elevations. By raising the living level 10 feet above grade, the occupants are protected from the risk of hurricane flooding and water can move freely under the house, safeguarding the structure's integrity. The ramp makes the house completely wheelchair accessible and also constitutes an additional safe exit route.

**AFFORDABILITY** The Desporte Ramp-House is a small house on a narrow lot, designed for an elderly couple to age in place. The main unit has 1150 square feet of enclosed heated and cooled space, in order to keep its cost within budget range. Covered and screened porches on three sides

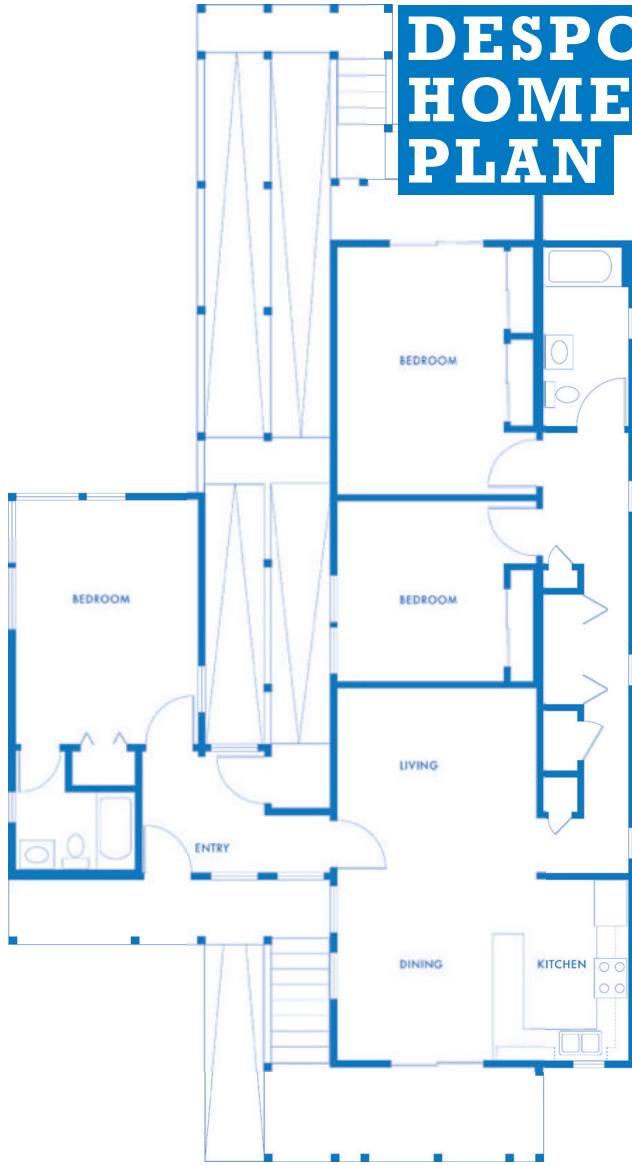
will provide 400 square feet for additional activities at a lesser cost. The short-span wood frame construction can be built with traditional methods and local labor.

**SUSTAINABILITY** The Desporte Ramp-House is designed with a number of sustainable features that derive from local building traditions, addressing orientation, natural ventilation, and shading from the sun. Deep-set porches protect the interior of the house from direct sun exposure on the east, south, and west sides. A screening system of horizontal slats define the porch perimeter and further protects from direct sunlight. The interior ceiling height of 13 feet at the north wall allows for the insertion of a series of operable clerestory windows to provide natural cross ventilation of all spaces. In addition to these features, all the materials and components of the house, from the cement-fiber siding to the HVAC units, were proposed to respond to a wide range of sustainability criteria.



# DESIGNER HOME

# DESPORTE HOME PLAN



Credit: CP+D Workshop

## The Construction Process

The first challenge this house faced came long before the first bit of dirt was moved. It was a challenge at the Zoning and Planning office. Two major components of the design attempted to confront current local requirements. The first was the use of land up to the property line to build the ramp, which required permanent structure and foundation outside of the zoned building setback. The second was the use of a detached accessory dwelling unit. Both of these issues relate to common questions for homeowners rebuilding in the area: How does one with limited mobility get into a home 10 feet off the ground? And can rental income help a family afford the cost of keeping and insuring a home?

We knew the solutions to these issues would require a leap of faith from local officials. After a few rounds of rejections, we found a compromise that still addressed these needs. In the end, we were not able to build an accessory rental unit and instead integrated this unit into the main home. The final ramp design featured some smart solutions that were able to preserve most of the integrity of the original design. A plan to use a landscaped berm as part of the ramp was abandoned due to setback requirements and cost.

Other changes to the design of the house were made in the planning phase. Gabion walls were removed, and we decided against using structural insulated panels (SIPs) for the main structure of the floor and roof systems because of the cost of SIPs compared to traditional framing. Also, the use of mini-split HVAC units came at a premium too high to afford. Once the design was finalized, we began construction in December 2007. The home was constructed very quickly due to its simple detailing and materials.

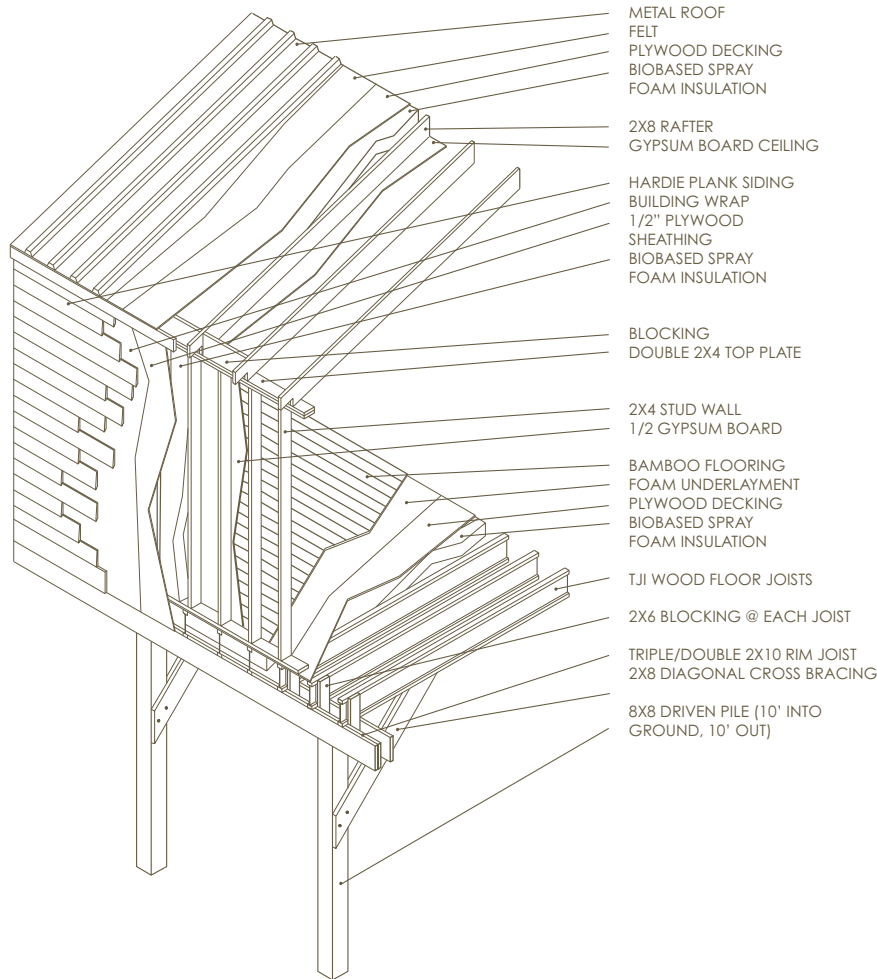


Photo credit: Leslie Schwartz/Architecture for Humanity



Photo credit: Architecture for Humanity

**“The architects were giving us ideas... flooring, what furniture to put in, ‘cause you know we lost everything... They talked about the building and how our electrical bill would be down.”** Jeanette Desporte, homeowner



Credit: Nicole Joslin/Architecture for Humanity

## Desporte Home Details

Architects: CP+D Workshop, Charlottesville, Virginia, Maurice Cox and Giovanna Gaifione-Cox; Gulf Coast Community Design Studio, Biloxi, Mississippi, Jody Rader and David Perkes

Maurice D. Cox is an associate professor of architecture at the University of Virginia School of Architecture. He recently completed eight years on the Charlottesville City Council and served as Mayor of Charlottesville from 2002 to 2004. He now serves as the Director of Design at the National Endowment for the Arts in Washington D.C.

[www.communityplanningdesign.com](http://www.communityplanningdesign.com)

Engineer: Roger Roepke, PE,  
Black Rock Engineering  
[www.blackrockengineering.com](http://www.blackrockengineering.com)

Contractors: Cox & Carr Construction

Landscape Architect: Paul Hendershot Design, [www.paulhendershotdesign.com](http://www.paulhendershotdesign.com)

Square feet: 1400

ABFE: 19 feet (10 feet above grade)

Actual Costs:

Hard cost (labor and materials): \$153,580

Material donations: \$21,770

Construction total: \$175, 350; \$125 per sq. ft.

Standardized Costs:

\$149,200; \$107 per sq. ft.







## The Odom Family

Louise Odom and her family had been living in Biloxi for 57 years and in their home for 21 years prior to Katrina. Louise is a single mother. Her 23-year-old daughter, Kishma, studies child development at Jeff Davis College. They both help take care of seven-year-old Dajontae, Louise's grandnephew, who is entering the second grade. (His request: a computer for his room in his new home.) Pre-Katrina, nearly every property on their street belonged to Louise's relatives. While many of her cousins and siblings are coming back, Louise is the first to rebuild and hopes to inspire more family members to return to their community. During construction, Louise lived first in a FEMA trailer, which made her sick, and later in a Mississippi cottage.

## The Design

The Odom home, because of its high elevation requirements and the original intention to include an in-law flat rental unit, was one of the most challenging homes in the program. The Gulf Coast Community Design Studio partnered with Studio Gang Architects to refine the design, which evolved greatly from the original concept and required new thinking and a new approach.

The original design for the Odom family by Studio Gang Architects, uses the pinecone as an inspirational organic model and investigates the ventilation potential of vernacular architectural elements like breezeways, prefab trusses, and operable shutters. A main breezeway was designed to bring cool air into the sleeping chambers, and perimeter verandas (deepest on the south and east) both shade the house and offer indoor-outdoor living options.

The roof and elevated floor were designed to provide ample space under the floor for utilities and create interior height to effectively ventilate the interior spaces through the stack effect. Operable shutters were designed to be closed along the porch perimeter to protect the house during hurricane season and could be opened regularly to capture prevailing breezes and meet the occupants' desires for shade and privacy.

Although the design evolved greatly, the final design respects many of these elements, including a large screened porch along the front of the home and a long side porch along the south side of the house that can be accessed

from each of the three bedrooms. In order to meet budgetary constraints, the in-law flat planned for the back of the property was removed from the final design and a number of other modifications were made.

## IN THE ARCHITECTS' WORDS

**HAZARD MITIGATION FEATURES** The home features a driven wood pile foundation with a stacked floor system. The detail is similar to foundations found in other communities along the Gulf Coast. This system is fast, economical, and very strong and has been adopted by the GCCDS as

**“When I was living in the FEMA trailer, I was struggling. I was crying every day. I have some friends, and we would get together and sit out in the dark—there wasn't any lights—and just be company for each other.”** Louise Odom, homeowner



Credit: Studio Gang Architects

a typical detail for homes. Manufactured trusses were used for some of the longer interior spans that help to open up the rooms of the house.

**AFFORDABILITY** The design employs common construction techniques making it comparably affordable at \$113 per square foot.

**SUSTAINABILITY** The house is flanked on the south side with a long side veranda that has access from each bedroom. The overhang for the veranda helps shade the south windows during the summer months, keeping the heat gain down while allowing natural light into the house. The front entry of the house is through a screened porch. These outdoor spaces add protection from direct sun and solar heat gain. The entire home is insulated with soy-based spray foam insulation. We created a conditioned space in the attic, which helps the mechanical system work less while still controlling the humidity. In addition, we chose ceramic tile and a glueless floating engineered wood flooring to cover the entire house floor. We also used a low-VOC/low-odor paint that is made of acrylic, which means adhesion is not an issue, as it can be with other products. The range and furnace are natural gas and other kitchen equipment is Energy Star rated.



# ODD ON WOOD HOME

## Studio Gang Architects



Credit: Studio Gang Architects

## A Design Evolution

The Pinecone Home's original design (shown left) was innovative in a number of ways, from the geothermal HVAC system to the use of tapered wood piles and prefab trusses. The demands of the high elevation requirement and the charge of including a rental unit made the Odom home one of the most challenging homes in the program. The Pinecone project team from Studio Gang Architects left no stone unturned in their attempt to find a way to incorporate these innovations affordably. One of the biggest obstacles was the 13-foot elevation requirement. "It was almost like building two structures," explains architect David Gwinn. "The cost of the home, of course, but also the cost of all the work just getting the house 13 feet in the air."

Structural connections between the foundation and the trusses proved complex to install, and finding an affordable solution for keeping exposed trusses from corroding in the harsh, moist salt air was challenging. Using stainless steel to make all the structural connections for the floor and parts of the roof was not affordable. The design specified tapered column/pile supports, but it proved infeasible to drive a tapered pile fat-end down. The operable louvers and clerestory windows were elegant but also involved a lot of detail work, for example to make a proper seal in the event of a hurricane. And the shutter systems proved too expensive—something that was an obstacle for several of the model home designs.

The team worked hard to overcome these obstacles, but after several pricing sessions, we reluctantly decided the Pinecone was not going to hit our price point. Architecture for Humanity and the GCCDS worked to incorporate many ideas from the original Pinecone house. This process gave us opportunities to integrate lessons learned about structural and foundation systems into the home's final design.

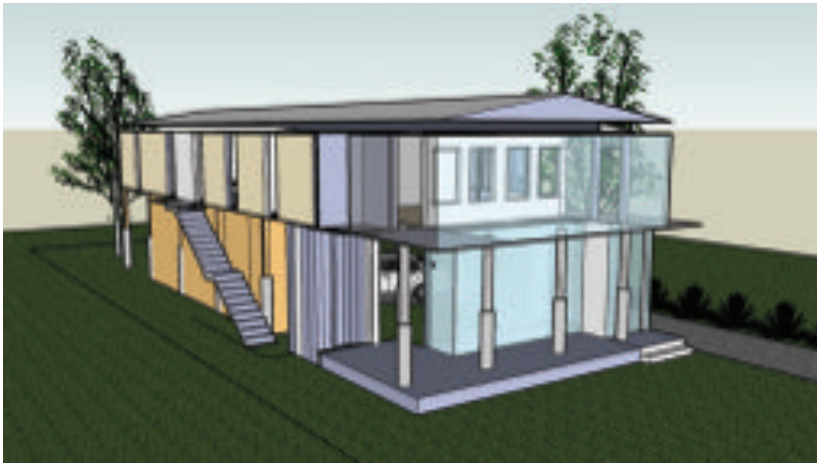
**“Louise brought such optimism to the table, which was remarkable after seeing the total devastation of her neighborhood. As she showed us around, she kept saying, ‘Here’s my neighbor’s place, I hope they move back in... I hope my cousin can move back in.’ Her hope for the future was always very close in our minds as we worked.”**

**David Gwinn, Studio Gang Architects**



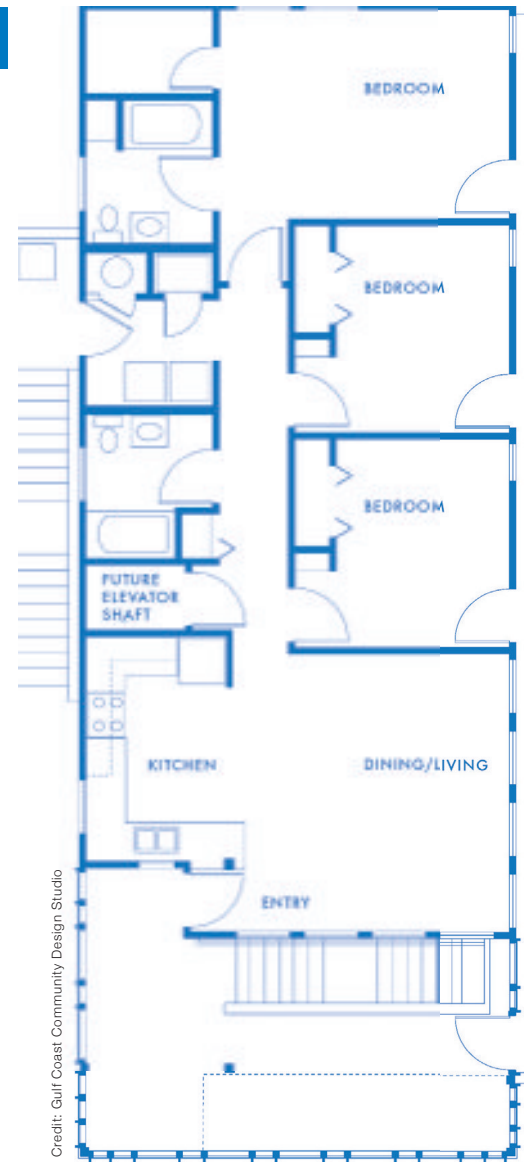
Photo credit: Architecture for Humanity

Credit: Gulf Coast Community Design Studio



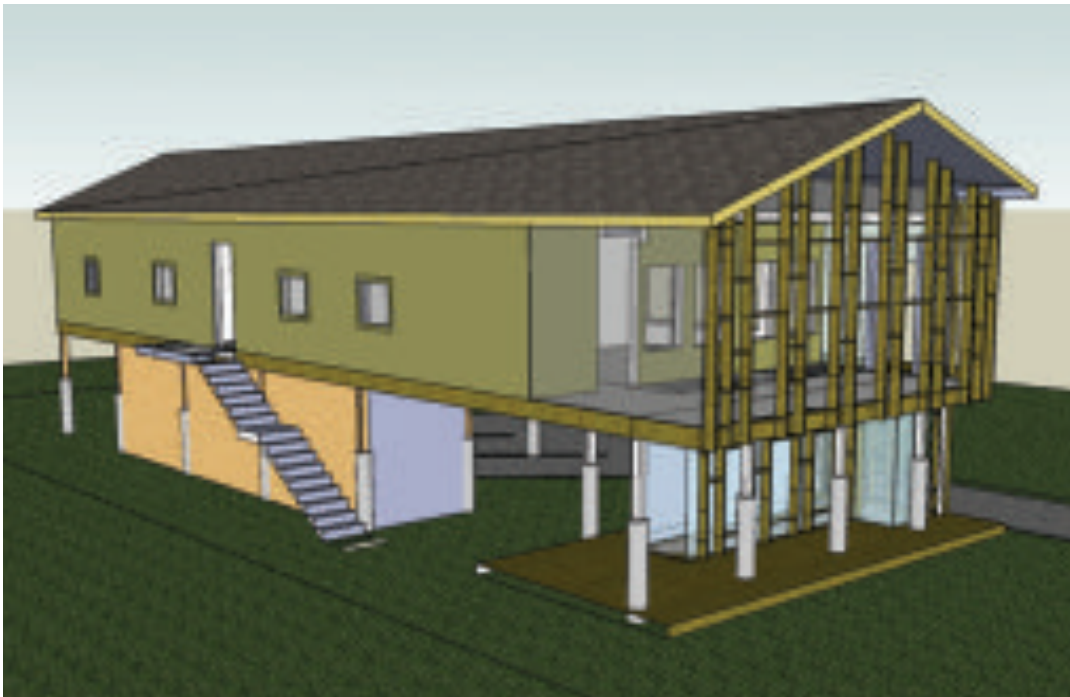
# ODOM HOME PLAN

Gulf Coast Community Design Studio



Credit: Gulf Coast Community Design Studio

Credit: Gulf Coast Community Design Studio





## What We Learned

In addition to the difficulty of locating contractors ready to use modular prefabrication over their traditional building practices, the design encountered cost escalation with the sustainable design. Ultimately the desire for an open, porous house to employ natural ventilation conflicted with the fact that affordable, prefabricated building elements are made to be completely contained within a conditioned environment; thus the step of treating the conventional materials and structural connections to withstand exposure to the harsh, moist salt air of Biloxi proved prohibitively expensive. This cost was exacerbated by the amount of metal ties that are required to 'strap' together construction elements in a hurricane zone. Furthermore, a porous skin that works well for ventilation has to be protected in the event of a hurricane or severe storm. While the house accommodated for this with operable shutters, in the end this double skin could not be supported by the target budget when compared to the cost of traditional disposable board-up materials.

When it was deemed that the home as designed could not be realized within the pre-set budget, the Gulf Coast Community Design Studio designed an alternate prototype that kept some of the original "Pinecone Home" intentions intact. —Studio Gang Architects

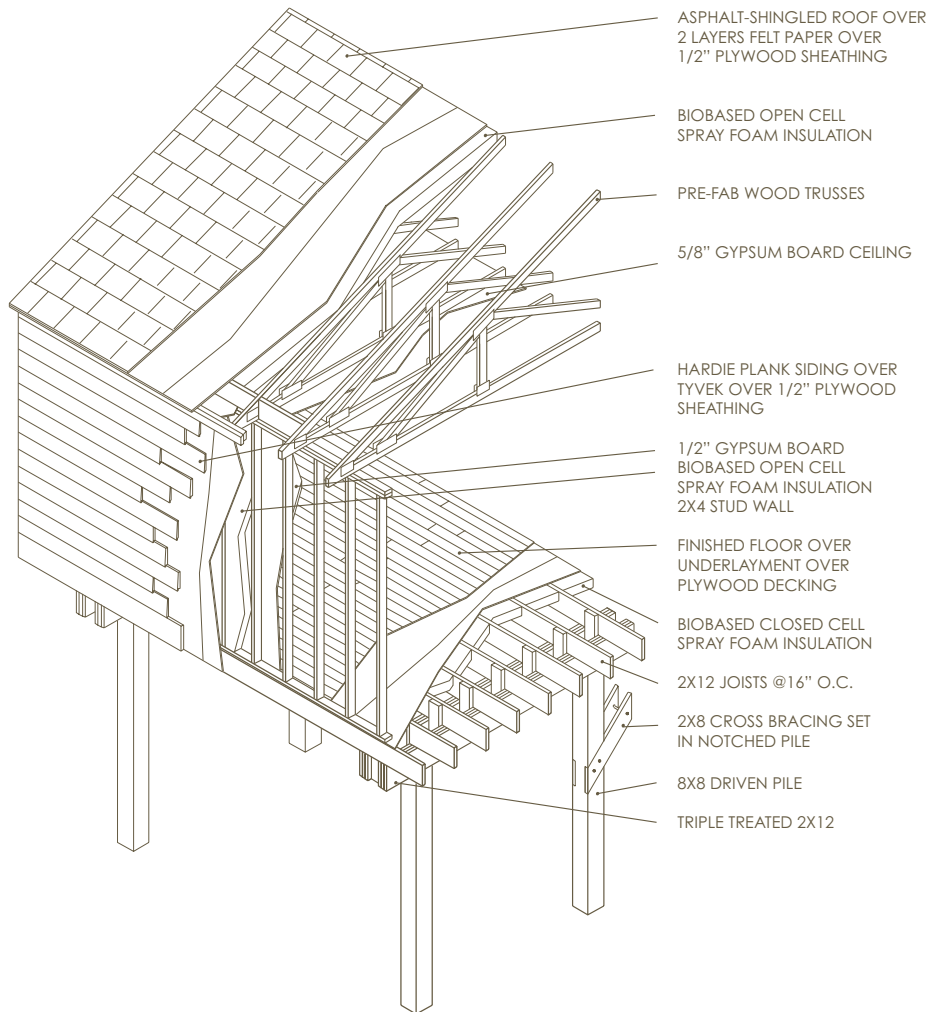
The Odom home taught us a great deal about what was and was not affordable, and though some of the obstacles to the original design were not overcome, this creates the opportunity to continue testing new thinking and new approaches on other homes.

The final evolution of the Odom home design kept the generous front porch and screened it in. It also preserved one of the side verandas with a deep overhang. The use of conventional HVAC over geothermal, the choice of off-the-shelf residential windows over storefront or other more expensive units, and the use of more conventional framing systems all helped to make the end project affordable.

The desire to innovate and explore new materials and methods must be balanced with a great deal of flexibility and open-mindedness. In the end, success came in choosing to focus on a single innovative aspect to explore—the integration of the outdoors—and committing to fully executing that one aspect, as opposed to losing the budget by attempting several challenging ideas at once. —Gulf Coast Community Design Studio



**“When the house is done, the first thing I’m going to do is have my pastor come over and bless the house. And then I’m going to cook up a whole lot of food!”** Louise Odom, homeowner



Credit: Nicole Joslin/Architecture for Humanity

## Odom Home Details

Architects: Studio Gang Architects, Chicago, Illinois, Jeanne Gang, David Gwinn, Mark Schendel, Kara Boyd;

Gulf Coast Community Design Studio, Biloxi, Mississippi, David Perkes and Price Taggart

Studio Gang offers design services with a commitment to excellence. Jeanne Gang established the practice in 1998 with a focus on combining sustainability and good design. Good design stems from intelligence, creativity, good communication, enthusiasm, and hard work. Studio Gang Architects is recognized for these qualities throughout all phases of architectural design. [www.studiogang.net](http://www.studiogang.net)

Engineer: Roger Roepke, PE, Black Rock Engineering, [www.blackrockengineering.com](http://www.blackrockengineering.com)

Contractors: Cox & Carr Construction

Landscape architect: Paul Hendershot Design, [www.paulhendershotdesign.com](http://www.paulhendershotdesign.com)

Square feet: 1400

ABFE: 19 feet (10 feet above grade)

Actual Costs:

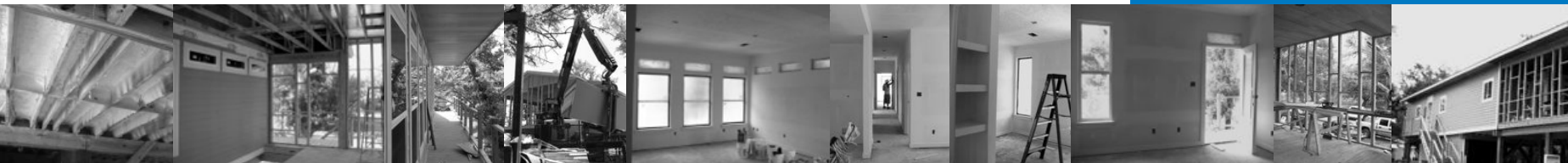
Hard cost (labor and materials): \$128,460

Material donations: \$37,430

Construction total: \$165,890; \$118 per sq. ft.

Standardized Costs:

\$145,175; \$89 per sq. ft.







## The Robinson Family

Audrey and Andre Robinson have both made a life out of volunteering to help others. Andre works for FEMA in logistics and has become his mother's caretaker as she battles breast cancer. Their home had been in the family for three generations spanning almost 80 years. The home would have likely survived Hurricane Katrina if an 18-wheel truck parked nearby had not slammed into the home, destroying it.

## The Design

The Robinson home creates a set of "in-between" zones between the landscape and the building and between the inside and outside. Perimeter vegetation helps connect the home with the surrounding landscape despite the obstacle of the home's elevation. The strategy for the interior spaces was created with flexibility at heart: expansion, contraction, tension, and inclusion. Opportunities for interaction are built into the design, making it easy to be in one space and feel connected to another. In-between zones can be reconfigured and activities can overlap.

Large porches along the front and side of the home allow for singular activities and moments of respite. The porches provide shade and protection from the heat of the day. And views from the porch and through the windows draw the landscape up into the house.

The house features post-and-beam construction with polycarbonate siding. The roofing is a low-slope metal roof system on prefabricated roof trusses. Clerestory windows made of impact-resistant glazing and impact-resistant polycarbonate sheeting allow soft natural light to float down into the interior spaces.

**“We liked the whole deck atmosphere of the house. We wanted to be different. It’s not like every other house. It’s kind of like a beach house, but back in the neighborhood.”**

**Andre Robinson, homeowner’s son**



Credit: Huff & Gooden Architects

## IN THE ARCHITECT'S WORDS

**HAZARD MITIGATION FEATURES:** The Robinson home is engineered to better withstand hurricane force winds. The polycarbonate clerestory windows that wrap around the house have 200 times greater impact resistance compared to typical glazing.

**AFFORDABILITY:** Straightforward structural systems using primarily off-the-shelf materials keep costs down to approximately \$108 per square foot.

**SUSTAINABILITY:** The fiber cement panels used for the exterior cladding are durable and affordable. Properly insulated metal roofing is another sustainable, affordable component of the design. The metal roof reduces

energy consumption by lowering the cooling loads. It is a highly durable product, has a high reclamation rate, and is recyclable. The polycarbonate clerestory windows are high-performance, aesthetically appealing, energy efficient, and allow for soft natural light. They are also recyclable. The landscape plan assists in solar protection within the house and in absorbing harmful emissions into the atmosphere. More than a dozen new trees have been placed on site, and the gardens help create a harmonious environment inside and out.



# ROBINSON HOME

# ROBINSON HOME PLAN



Credit: Huff & Gooden Architects

## The Construction Process

The Robinson project is a very long narrow house with a sleek roofline. The roof is simple in form but was challenging to build due to its subtle slopes. This project also needed to address sensitive family issues to determine whether a 3-bedroom or 2-bedroom home could be built. In the end, the importance of the third bedroom to the family required us to face the budget head-on and make decisions that would save us the money we needed to make the house as large as it was. Suggesting a change to the foundation system from poured concrete columns to driven wood piles helped save some of the money needed to make the third bedroom a reality. The Robinson family also contributed some of their own funds to allow the third bedroom to remain part of the design.

## What We Learned

The Robinson design went through a number of edits to streamline the design and bring it into the range of what was possible budget-wise. We exchanged several materials, fixtures, and details for more simple replacements while attempting to preserve the original spirit of the design. Windows were changed from storefront-style windows, which integrated with the clerestory windows above, to more conventional residential units at conventional sizes. The roofing material was changed from a standing seam metal roof to a screw-down corrugated metal panel to maintain the budget while keeping the basic design. The final lesson was the clerestory windows, which were generously donated to the project and would not have been affordable otherwise.

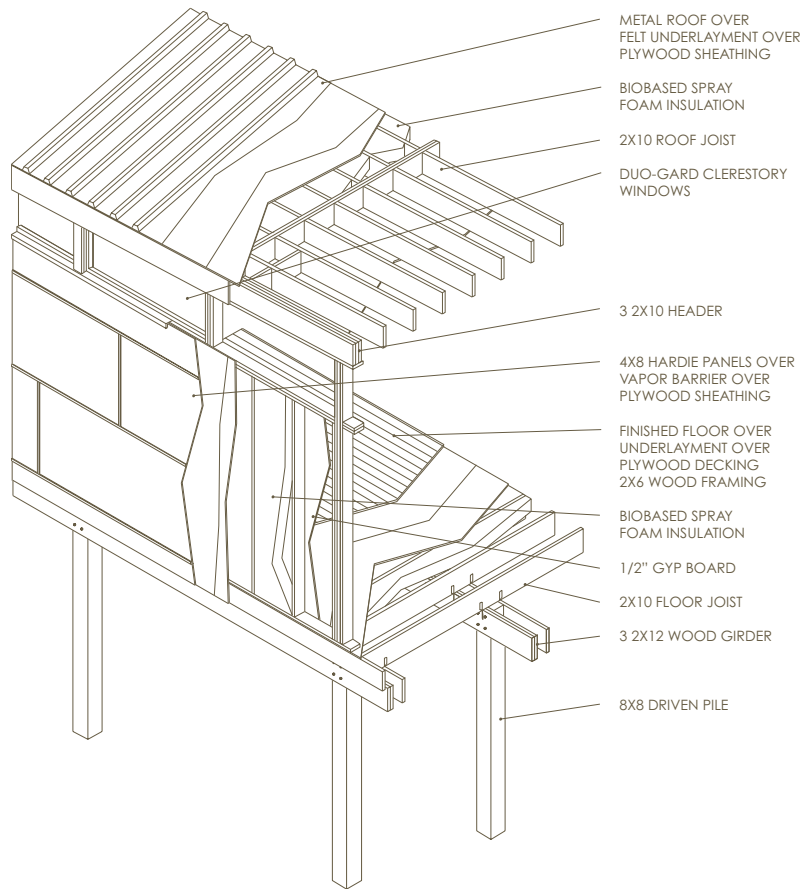


Photo credit: Leslie Schwartz/Architecture for Humanity



Photo credit: Architecture for Humanity

**“It’s important that the housing celebrates the potential of Biloxi, that it looks forward to creating a new community. During the design process, it was very important to us that it not look like a reaction to the storm, that it not look buttressed or fortified... We didn’t want it to be stigmatized as a replacement house.”** Ray Huff, architect



Credit: Nicole Joslin/Architecture for Humanity

## Robinson Home Details

Architects: Huff + Gooden, Charleston, South Carolina, Ray Huff, Jaimie Abel, Connie J. Kaplan

Ray Huff and Mario Gooden formed Huff + Gooden Architects LLC in 1997 as a collaborative architecture practice dedicated to the design and exploration of architecture and its relationships to culture and knowledge. [www.huffgooden.com](http://www.huffgooden.com)

Engineer: 4SE Inc., [www.4seinc.com](http://www.4seinc.com)

Contractors: Cox & Carr Construction and George Boatner

Landscape architect: Paul Hendershot Design  
[www.paulhendershotdesign.com](http://www.paulhendershotdesign.com)

ABFE: 18 feet (7 feet above grade)

Square feet: 1600

Actual Costs:

Hard cost (labor and materials): \$148,690

Material donations: \$40,050

Construction total: \$188,740; \$118 per sq. ft.

Standardized Costs:

\$159,500; \$98 per sq. ft.







## The Tyler Family

Richard Tyler has lived in Biloxi his entire life and works as a commercial and residential painter. Tyler inherited the home he lived in prior to Katrina, a home that survived Camille in 1969. During Katrina, the waters rose high in his neighborhood. His home was destroyed by a church floating into the home and knocking it down. He lives with two of his sons, Richard Jr. and Zarek. Zarek, then just 14, swayed his father's decision making in favor of the Porchdog design at the Model Home Fair.

## The Design

The proposition of raising a home 12 feet above the ground introduces several issues that challenge the traditional notion of the Gulf Coast streetscape and affiliated porch culture. Among these is the very concept of having a porch that is an extension of the interior space. In addition, the massing of a proportionally tall house speaks more of isolation than of the construct of a meaningful social space. The Porchdog house addresses these challenges while providing the requisite protection from a potential Category 4 storm surge event.

The Porchdog house is a refuge that still opens itself to the social structure of the city. While the house is raised above the ground and essentially open at the ground level, it incorporates a small stoop, entry stair, enclosed storage volume, a parking area, and a stair descending from the rear deck. The Porchdog house is designed for any east-west facing site regardless of slope and/or vegetation. The house presents solid north- and south-facing walls against the coastal wind and operable east and west facades to the street and rear yard that can be closed in threatening weather. The primary interior spaces access two separate porches. On the street side, both the primary master bedroom above and the great room below enjoy controlled exposure to the street. In contrast, a tall rear porch connects the outside with the dining, sitting, and sleeping spaces inside.

Through simple plan manipulation, the Porchdog house offers a wide range of living configurations. The room in the southwest corner of the downstairs plan can be a bedroom, a master bedroom, a home office, or a "granny flat." Moving the hallway door west of the bathroom to the eastern side of the bathroom creates a master suite or an entirely separate unit complete with

its own access from the rear stair. Upstairs, a bunk room has capacity for up to four children and sits adjacent to a space that can serve as a play area, a sitting area, or a small study.

The Porchdog shutter systems are unique to this house and allow the entire building to be closed off to inclement weather and respond to daily climate and solar needs.

## IN THE ARCHITECT'S WORDS

**HAZARD MITIGATION FEATURES:** The house presents solid north and south-facing walls against the coastal wind, and operable east and west facades to the street and rear yard. The west facade's three large roll-up shutters can be raised and lowered independently for shading

**“When I looked at the book the architect had, the houses he'd built, they all looked just so beautiful from the inside. There's lots of light and it feels so open. Outside, it looks like something from the Jetsons... It's got a porch all the way around; that's probably my favorite part.”** Richard Tyler, homeowner



Credit: Marlon Blackwell Architect

and protection, and the east side's operable shutter system protects the glazing with independently sliding louvered panels. The steel structure is designed to absorb the force of a Category 4 storm surge event, and the floor level has been raised to meet new FEMA standards for flooding. In addition, all materials below the 12-foot flood line are rot and moisture resistant, durable, and able to be repaired if damaged.

**AFFORDABILITY:** The house has a structural steel frame and metal skin that aren't normally practical for affordable housing; however, the savings in construction time and life-cycle cost make it a viable solution. The small footprint and stacked plan reduces site impact, decreases foundation size, and makes it adaptable to a variety of sites.

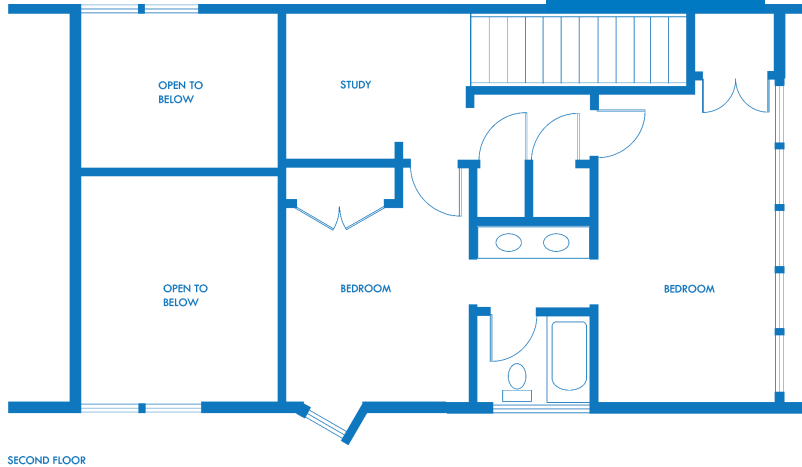
**SUSTAINABILITY:** The entire house is designed around the use of structural steel and wood stud infill. The structural components, skin, are prefinished, durable, and do not rot or mold. The exterior shutters reduce glare and solar heat gain, and operable windows throughout take advantage of coastal breezes. Soy-based foam insulation makes an eco-friendly and air-tight enclosure.



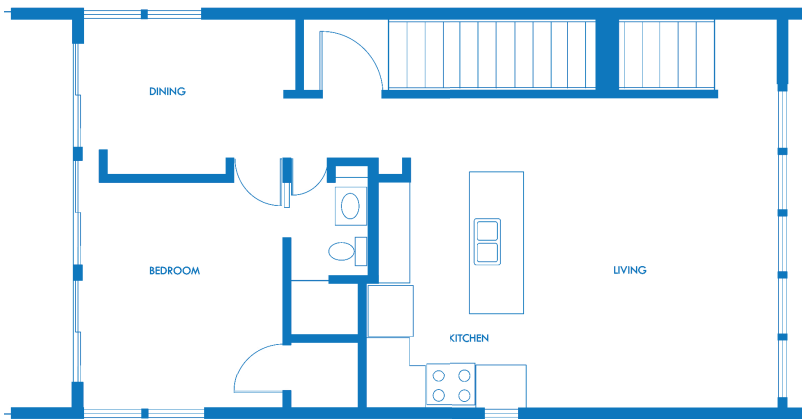
# TYLER HOME

Photo credit: Marton Blackwell Architect

# TYLER HOME PLAN



SECOND FLOOR



FIRST FLOOR

Credit: Marion Blackwell Architect

## The Construction Process

Before we could begin construction on the Tyler home we needed to help him purchase an adjacent vacant lot. This gave us potentially much needed space to accommodate ordinances that required deeper setbacks on corner lots. The funding and time needed to accomplish this pushed the project start date back considerably, but insured that the project would be viable and helped revive the block as a whole.

The design of the project required lots of heavy-gauge steel, and we spent many months exploring alternative building systems and materials such as metal building components and light-gauge metal framing. We finally settled on a concrete footing with driven wood subpiles supporting metal columns. This home suffered from some construction delays due to lead times for certain specialty materials not typical of affordable housing and due to the difficulty in planning work schedules around lead times. At press time, the target move-in date for Richard and Zarek is October 2008.

## What We Learned

Building a two-story structure proved only marginally more expensive than building a single story. The house pushes the limit structurally and requires several components for which we paid a premium, including the steel foundation, the shutter systems at the front and rear, and large expanses of glass, which also necessitated additional structural strength modifications. Moving forward, we believe there is an opportunity to explore other approaches to steel frame construction to help it become a viable, affordable choice for homes in this region.

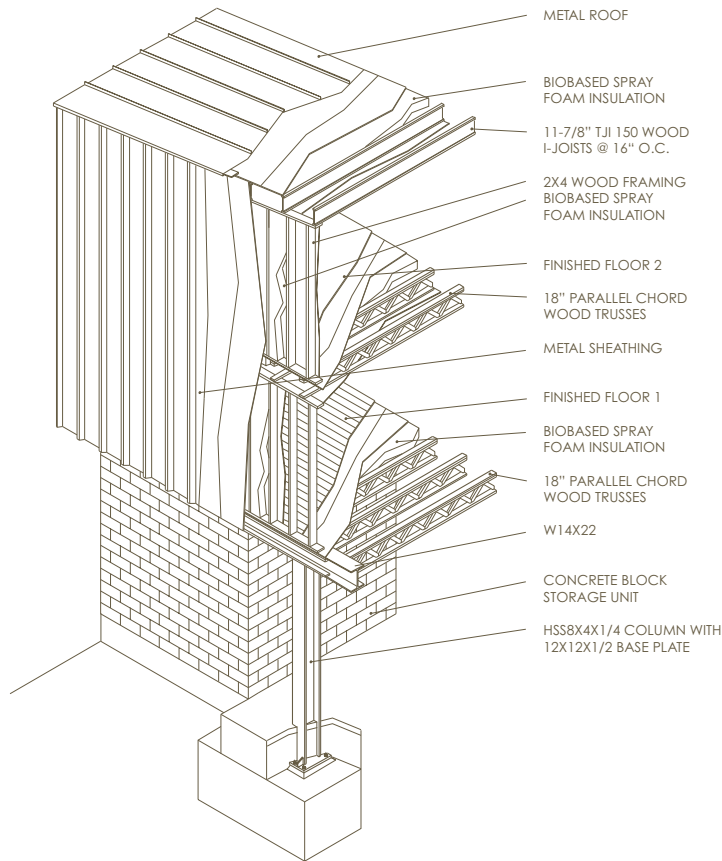


Photo credit: Leslie Schwartz/Architecture for Humanity



Photo credit: Architecture for Humanity

**“When we met with Richard to allow him to make adjustments to the design, he was very passive. Later that day, when we went to his home, he relaxed with us. We explained that we were down here to streamline it for him and his family. And he said, ‘whatever you do is better than what I have now’... This is a client who just wants a place to live. It was like, wow, *okay.*”** Marlon Blackwell, architect



Credit: Nicole Joslin/Architecture for Humanity

## Tyler Home Details

Architect: Marlon Blackwell Architect, Fayetteville, Arkansas

Marlon Blackwell was born in Munich, Germany, in 1956. He is an architect and tenured professor at the University of Arkansas in Fayetteville. Work produced from his private practice, Marlon Blackwell, Architect, has received national and international recognition through AIA design awards and several architectural publications. [www.marlonblackwell.com](http://www.marlonblackwell.com)

Engineer: Roger Roepke, PE, Black Rock Engineering; Tatum Smith Engineering Inc, [www.tatumsmith.com](http://www.tatumsmith.com)

Contractors: Cox & Carr Construction and Herbie Holder

Landscape architect: Paul Hendershot Design, [www.paulhendershotdesign.com](http://www.paulhendershotdesign.com)

ABFE: 19 feet (10 feet above grade)

Square feet: 1500

Actual Costs:

Hard cost (labor and materials): \$250,600

Material donations: \$50,350

Construction total: \$300,950; \$200 per sq. ft.

Standardized Costs:

\$197,000; \$132 per sq. ft.







“THERE’S SOMETHING VERY IM  
PERSON BACK INTO A HOME. I  
PLAN B, TWO BEDROOMS AND  
THINGS THAT GET IGNORED W  
LIKE HANDICAP RAMPS AND O  
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ARCHITECTURE FOR HUMANIT

IMPORTANT ABOUT HELPING A  
T'S NOT JUST, 'HEY, YOU GET  
A BATH.' THERE ARE A LOT OF  
WHEN YOU DO THAT, THINGS  
THEIR ACCOMMODATIONS FOR  
LIFE." —MICHAEL GROTE,  
MY PROGRAM MANAGER

DESIGN DETAILS

# SUSTAINABILITY

Sustainability in architecture, as in most fields, is a concept that is dependent on context. Our definition of sustainability, in the context of the Biloxi Model Home Program, was rooted in a long-term view of the survival of a particular home. We thought about the prosperity of not just the first owner but generations of families living in the home.

This definition takes into account both questions of ethical, sound building practices and questions of long-term affordability. We ask not only “Will this home sustain past the next storm?” but also “What condition will this home be in 10 years from now, or 50 years from now?” Simply put, this program had two main related challenges: elevating homes to new flood zone elevations and building homes strong enough to resist hurricane-force winds. Wind load factors compound the challenge of elevating a home because of the need for it to resist greater forces further away from the point at which it is anchored to the ground. We addressed these issues, often going beyond the necessary code, without creating a premium for the work.

Sustainability to us also means rebuilding within the existing infrastructure of East Biloxi. This is not only where our clients live but also where they go to school, attend church, and share time with their families and their neighbors. The prospect of developing new affordable housing for East Biloxi residents in a more traditional model, such as a greenfield development on a site away from the homeowner’s property, put a low value on community and the social networks that survive even a disaster of the magnitude of Hurricane Katrina. While developing on a single property away from the

**Below:** Installation of soy insulation was key in increasing energy efficiency. Four of the homes benefitted from this type of insulation.



Photo credit: Architecture for Humanity

existing community may offer a small amount of savings, those savings disappear when one takes a broader, more long-range view of the cost of this type of development, factoring in issues such as time spent away from the family commuting to school and work, the difficulties of implementing affordable transportation systems, and the costs of gasoline consumption. We chose instead to rebuild on the homeowners’ existing lots. This lot-by-lot infill development approach took more thought in terms of the legal and financial structure of the program, but allowed us to preserve the fabric of the community.

For us, affordability was as important as sustainability. The designs in the Biloxi Model Home Program could not burden homeowners with additional costs when we knew their budgets were already strained due to the storm, its aftermath, and the impact on the local economy and job market. Although we would have liked to pursue LEED Certification, it would have cost as much as \$20,000 - \$30,000 per home. Instead, we opted to pursue sustainability in the ways that mattered most to our clients by reducing energy and upkeep costs and preventing material waste. We wanted our families to be secure in the knowledge that they would be able to live in these homes as long as they wanted to, and that they would be able to afford their electricity bills, their gas bills, their insurance bills, and the routine maintenance the home requires. At every stage, we asked ourselves if we could see our clients living comfortably and affordably in their homes well into the future. Energy efficiency choices, including often insulating the homes to above what was required by code, sometimes involved higher up-front costs but meant heating and cooling bills would be lower. In addition, design choices that made these homes stronger and more storm-resistant could, in a few cases, help the homeowner save money on flood and wind insurance. The complex elevation and building requirements necessary to realize insurance savings vary from insurance company to insurance company and unfortunately proved to be a challenge to incorporate into our designs. As housing recovery centers and the Gulf Coast Community Design Studio (GCCDS) learn more about this issue, however, they hope to pass along insurance savings to new homeowners.

Sustainable options were not always clear and did not always come easy during the design process. Meeting our budget goal for the initial construction of the homes sometimes came at odds with our other goal of long-term affordable living. Making smart choices was a balancing act. Overall, we focused our limited resources on two tangible goals: durability and energy efficiency. We knew we could not afford many of the most cutting-edge products in the marketplace, so we chose smart but relatively low-tech energy-efficient products in the areas of insulation, appliances, and mechanical systems.

Convention was often our best design partner when we faced issues of sustainability and affordability. We took a slow, conservative approach to what works and continued incremental improvement of methods and processes. These principles aren’t sexy, but they’re what get homes built.

# ENERGY EFFICIENCY

Affordability does not end with the initial construction costs of a home. One of the main goals of the Biloxi Model Home Program was to focus on energy efficiency as a way of keeping down the monthly costs of running the home. For our families, these costs are nearly as important in their monthly budget as their mortgage payment.

Good insulation, moisture control, and the use of energy efficient appliances should result in a direct energy savings of 30 to 50 percent for our homes, compared with standard building practices.

Energy efficiency begins with good insulation. Four of our homes were completely insulated with a new soybean-oil based spray foam insulation (open cell and closed cell), which we believe should become standard practice for new, elevated homes in this region. Soybean-oil spray foam insulation is especially effective in creating a more complete envelope for conditioned space. Three of our homes were insulated to well above the energy code requirements using traditional methods.

Choosing energy efficient doors and windows and assuring their weather-tight installation was also important to creating a sound insulation envelope.

Creating an impermeable moisture barrier is also an important aspect of energy efficiency. In hot and humid climates, moisture control becomes as important as R-value. Heat can often move through a wall in the form of

moisture in the hot, humid air. If a moisture barrier is not carefully created, a dew point may be created in the middle of the wall, leading to unwanted moisture within.

We chose EnergyStar rated kitchen appliances: refrigerators, electric ovens, dishwashers, and microwaves.

The last major focus for overall energy efficiency was on the mechanical system equipment. In hot climates, it's often common to assume that bigger is better when it comes to installing mechanical systems to deal with the summer heat. This is truly not the case. Along the Gulf Coast, moisture control in summer is just as important as heat control. The larger the unit one chooses, the less it will run. And the less it runs, the less it has a chance to dehumidify the interior air. This means that the potential for dangerous mold and mildew growth actually goes up with the choice of a larger unit. However, it is also important not to under-size the unit, as it will be on constantly. We worked closely with our mechanical subcontractors to choose optimal-size mechanical units, keeping in mind the importance of an effective moisture envelope around the home.



Nguyen Home - Photo credit: Architecture for Humanity



Parker Home - Photo credit: Architecture for Humanity

# CARBON OFFSETTING

According to the Department of Energy, residential energy consumption is responsible for 20 percent of total carbon dioxide emissions in the United States. Energy used by U.S. households exists primarily as electricity, natural gas, and heating oil. Energy consumed by the Biloxi Model Homes was almost exclusively in the form of electricity, the majority of which was generated from coal-fired power plants.

Because a major component of the Biloxi Model Home Program was energy efficiency, we thought it worthwhile to explore whether the energy saved by these homes would result in sufficient carbon dioxide (CO<sub>2</sub>) reduction to warrant selling these reductions as carbon credits on the carbon offset market.

We computed the energy savings by comparing electricity consumption in the Biloxi Model Homes to standard new homes built without the efficiency measures implemented in our program. The energy differences related to lighting (compact fluorescent lamps vs. incandescents), refrigerators, air conditioning, heating, clothes washers and dryers, and dishwashers. (Note, we did not calculate energy savings from passive solar building design, insulation and other design changes as no accepted standard exists against which those savings could be measured.) Using conservative estimates from appliance tags, the Energy Star website, and data from the Energy Information Administration, we calculated an energy savings of about 25 percent, or roughly 3500 kilowatt-hours (kWh) per Biloxi Model Home per year.

We applied an energy-to-CO<sub>2</sub> conversion of 1.413 pounds of CO<sub>2</sub> per kWh (the average conversion for the state of Mississippi) and approximated a carbon reduction of 2.5 tons CO<sub>2</sub> per Biloxi Model Home per year. Across 100 homes, this would equate to 250 tons of CO<sub>2</sub> per year. With market prices for carbon offsets ranging from \$4/ton to \$25/ton, selling credits from 100 Biloxi Model Homes would earn revenue of between \$1000 and \$6250 per year. Even selling 10 years' worth of credits would yield relatively small savings considering the costs associated with verifying and registering these credits with an official carbon offset market.

**Colleen Howell, PhD, environmental researcher, writer and consultant**



Photo credit: Architecture for Humanity

**Below:** Comparison chart of appliance energy usage in kilowatt hours per year for Biloxi Model Homes versus typical new homes. New home appliances result in an energy savings of 2.5 tons of CO<sub>2</sub> per year, which over the lifespan of a home [50 years] adds up to a savings of 120 tons of CO<sub>2</sub>.

Appliance	Biloxi Model Homes	Typical New Homes
Microwave	98	98
Range with self-cleaning oven	145	145
Color TV	78	78
Stereo with CD player	124	124
Personal computer	208	208
Lightbulbs (compact fluorescent in Biloxi homes, incandescent in typical homes)	500	1090
Refrigerator (Energy Star certified in Biloxi homes)	828	1638
Electric oven	62	73
Dishwasher (Energy Star certified in Biloxi homes)	320	450
Clothes washer	79	90
Clothes dryer	520	570
Hot-water heater	2587	2587
Electric furnace	2427	3467
Electric central air conditioning	1803	2576
<b>Total kilowatt hours per year</b>	<b>9779</b>	<b>13,194</b>

# ACCESSIBILITY

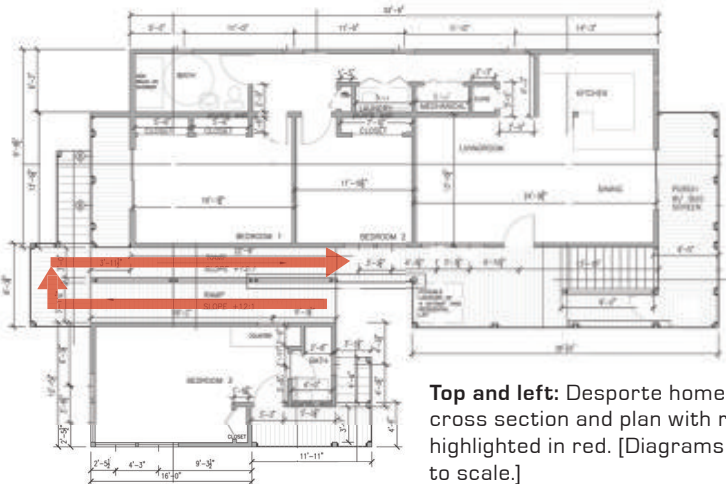
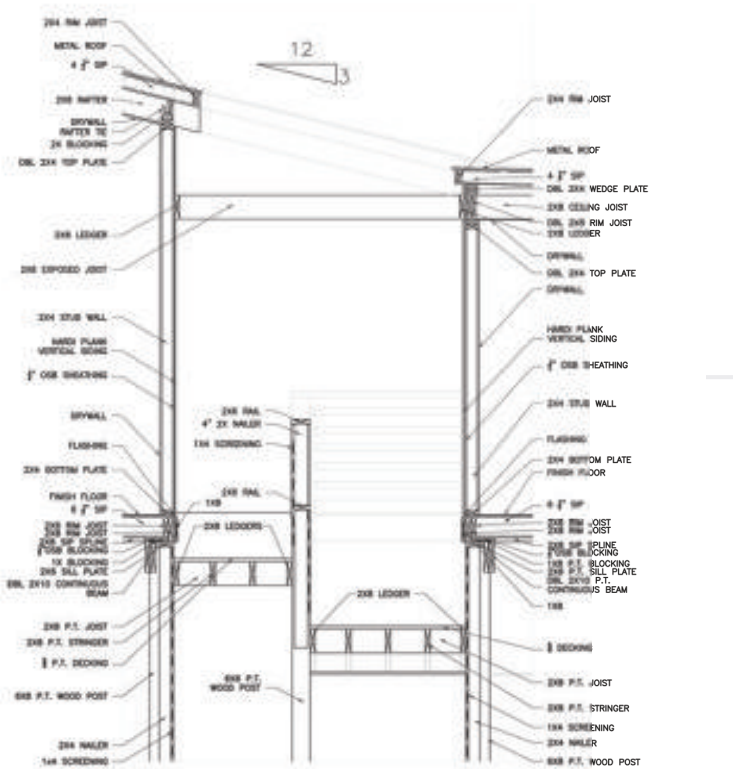
As with many other elements of the design process, accessible design in our model homes forced a careful balance between needs, desires, and cost. All of the model home designers were aware of aging in place concerns, and the majority of the designs featured open floor plans, low-barrier or barrier-free entries and interior thresholds, larger bathrooms and kitchens, and wider doorways and hallways. Taking the time in the design stage to consider these features makes a relatively small impact on the overall construction cost and eliminates the need, should one arise, of going back later to enlarge halls, doorways, kitchens, and bathrooms for wheelchair access. We found these gestures to be a smart use of funds, even for non-disabled homeowners. We did not build in other accommodations (such as handheld shower fixtures), which could be easily retrofitted at a later date.

The biggest and most obvious need we had to address in terms of long-term accessibility was that of outdoor access. The Desporte home is the best example of our efforts on this front. It was a challenge to integrate the design of a ramp that would allow Mr. Desporte to access a home that was elevated 10 feet above grade. The ramp needed to look elegant, be resistant to storms and harsh salt air, and fit into our tight budget. To accomplish all this, we knew the ramp could not be added as an afterthought; it needed to be planned for from the beginning. The design by Maurice Cox and CP+D Workshop begins at grade at the front of the home, runs up through the home's center, makes a switchback turn at the back of the home, and finally finishes at the first floor level at the front entrance, right next to where the front stairs top out. By running the ramp through the center of the home, it avoids the look of a tacked-on appendage.

The Odom and Robinson homes have spaces where an elevator could later be added if needed. MDA elevation grants (see chart, Chapter One) are supposed to provide an additional \$25,000 for elderly or disabled residents to help defray costs of building ramps and elevators to access new elevated homes. When these grant funds come through for these families, elevators may be added.

Credit: Gulf Coast Community Design Studio

Credit: Gulf Coast Community Design Studio



**Top and left:** Desporte home cross section and plan with ramp highlighted in red. [Diagrams not to scale.]



Credit: Leslie Schwartz/Architecture for Humanity

# ENGINEERING AND CONSTRUCTION

As discussed in Chapter One, collaboration was an overall key to the success of the Biloxi Model Home Program. This collaboration extended beyond the staff of the Hope Coordination Center to the engineers, contractors, building supervisors, and other construction professionals of the program.

## Engineering Lessons

Engineer Roger T. Roepke, PE, of Black Rock Engineering says that the success stories of the Biloxi Model Home Program all involved these critical elements:

1. A design that uses conventional building materials. “Reinventing the wheel is time consuming and costly,” says Roepke. “Different is not always better,” especially after a disaster when speed and clarity are paramount.
2. A collaborative approach that gets local contractors involved early in the process and offered them clear ways to share their input. “The collegial atmosphere brought out many cost effective and timely solutions. Ideas from local contractors were often faster, cheaper, and stronger than the original,” says Roepke.
3. If it works, don’t change it. When something works, such as the driven wood pile foundation system, stick with it. “After about a year, we learned how to install a cost effective foundation system,” Roepke explains. “Every time we tried something else, we blew the budget.”
4. Engineers taking the time to explain our designs. “When you tell a designer or a builder that there’s 20,000 pounds of lateral force on a building, it gets their attention and they begin to understand the reason for all the shear walls and bracing,” says Roepke.
5. Flexibility and honesty. Engineers, architects, and builders need to be able to rely on input from others and focus on the overall goal of getting families into their homes. The ability to adapt designs based on feedback is key. “It’s never easy to hear that your ‘great idea’ doesn’t pencil. You need to listen and try to understand why,” says Roepke.

## Construction Lessons

One of the most challenging aspects of the Biloxi Model Home Program was labor. When volunteer labor isn’t used, local contractors must be found who can do the job on time and on budget. Because there is still so much rebuilding to be done in the area, it’s very difficult to connect with contractors who are willing and able to get houses built. Affordable housing comes at the bottom of the pay scale behind projects like bridges, casinos, and condos.

Biloxi Model Home program manager Michael Grote dove into the process of finding local contractors early on after the storm. He asked around while on job sites doing rehabs and literally jotted down phone numbers off the sides of trucks as he traveled in the neighborhoods. Grote’s best advice is to start asking and calling around, and keep one’s ear to the ground. “It’s tough terrain out there,” says Grote. “Contractors don’t make a lot of money building just one house—that’s taking on a lot of liability and risk. I heard a lot of ‘good luck, buddy’ when people saw the budget we had to work with. I got blown off a lot.”

Laying the groundwork and reaching out to local contractors happened well before the model homes were ready to break ground—in some cases, up to a year ahead of time. “We can’t roll up in town with all these designs, be ready to build, and expect that it’ll happen and happen on budget,” says Grote. Getting local contractors involved early allows time for collaboration and discussion. “The contractors will be really honest—they’ll say ‘this will be more expensive because of this,’” explains Grote. “There’s often a separation that happens between the architect and engineer, and the contractor. But this is a process where everyone involved needs to have an equal seat at the table,” says Grote.

**“It’s clearly a difficult process, and you have to be willing to compromise. You have to embrace the obstacles, figure out what’s most important to the project, and push that one thing... Embrace the necessity of the economics. The budget’s not a negative; it’s a positive. Some beautiful things can be done because of it.”** David Gwinn, Studio Gang Architects



Photo credit: Architecture for Humanity

Photo credit: Architecture for Humanity



Photo credit: Architecture for Humanity



**Left:** Engineer Roger Roepke works out solutions with the construction management team at their Hope Coordination Center offices. **Above and right:** The wood pile driving equipment at work, the 39 on the pile at right is the blow count for the last 4 inches of driven pile.

Photo credit: Architecture for Humanity



# FOUNDATIONS

Foundations are the first line of focus for elevated homes. The Biloxi Model Home Program professionals explored different foundation materials for performance, aesthetics, building code requirements, and, most of all, budget. We discussed solid concrete columns, steel columns on concrete footings, driven wood piles, wood columns on concrete footings, and nearly everything in between.

Three distinct issues came into play:

- 1) structural requirements,
- 2) waterproofing, according to specifications from the National Flood Insurance Program, and
- 3) budget. Not surprisingly, the budget issue was the main limiting agent. The overall goal was always to test affordability, sustainability, and aesthetics.

## East Biloxi's Geology

The typical soil in East Biloxi is a loose sand and silt composition with a very shallow water table, sometimes only a few feet below grade. This soil type makes driving piles an easy choice for foundations.

These types of soils, common in coastal areas, tend to be susceptible to

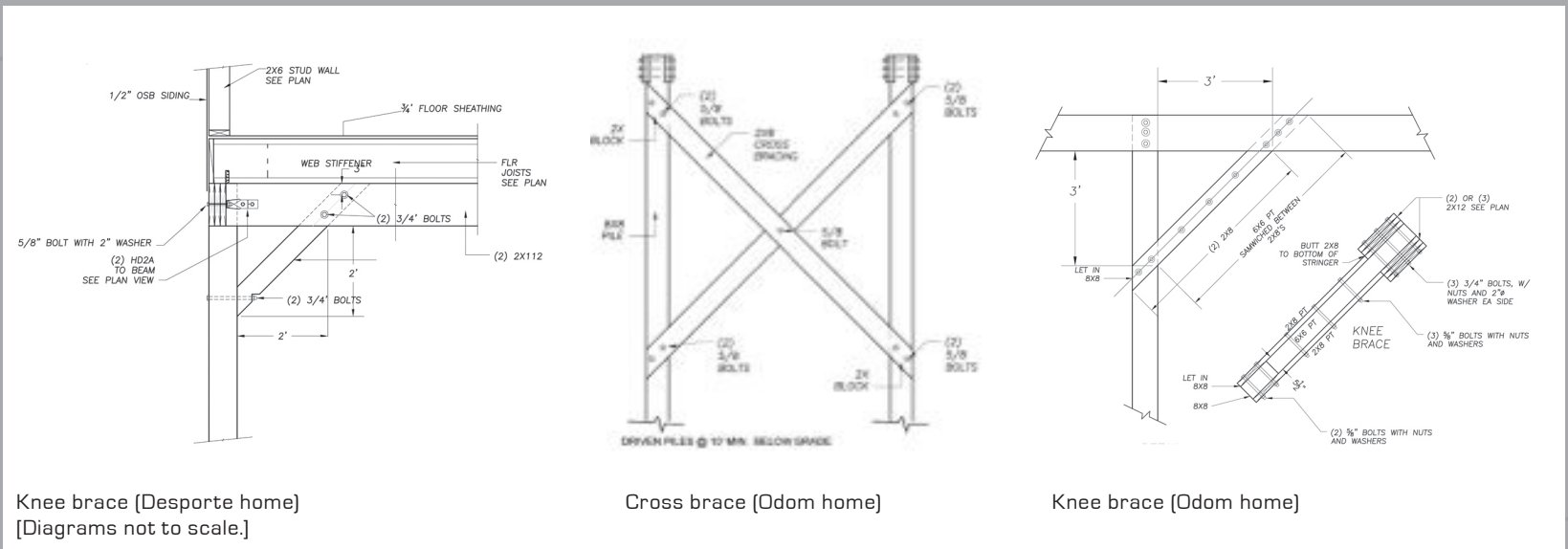
scour or erosion. Driving a pile many feet into the ground is a safeguard against the erosion of the soil that supports the foundation. If the soil supporting a foundation is compromised, it could easily mean a total structural failure. This happened to many structures close to the shoreline of East Biloxi due to wave action during the storm.

The soil variation from site to site became evident. For example, the Parker foundation was dug with ease. The soil stayed intact and compact for work below grade. The Nguyen and Tran homes' soil was very loose and wet. The footings filled with water, and we needed to pour a mud slab to get the footing dry enough to pour.

## Bracing

The higher a home is elevated, the greater the need to brace the foundation system. The bracing transfers lateral loads to the foundation in an effective manner.

Typical bracing for our homes consisted of knee bracing and "X" bracing.





## Foundation Methods

We worked out three distinct foundation methods and found driven wood piles provided the best combination of strength and cost-efficiency.

### Concrete Pedestal on Footing

This structural system, designed with CSF Engineering in Houston and Chung Nguyen of MC<sup>2</sup> Architects of Houston, was used on the Nguyen, Tran and Parker residences. We used 6' x 6' spread footing or a 4' continuous footing for each pedestal to bear on. Each column was connected to the pedestal via a “wet set” hold-down anchor, and each column ran continuously through the walls of the house to the top plate of the exterior wall. This system created a stronger frame and a stronger connection from wall to floor to foundation.

### Concrete Foundation with Steel Columns

This system was used on the Tyler home and was designed to minimize the number of points on which the building would bear. Doing this raised the required load-bearing and lateral load capacity of the columns. Using steel columns became a necessity due to the required capacity.

The foundation for this design requires large footings with heavy mats of reinforcing bars and bolts for the steel to connect to. Reinforcing bars and bolts are much larger than average. With routine maintenance, this is a very strong and stable system over time, but it is difficult to construct in a cost-effective manner for affordable housing models.

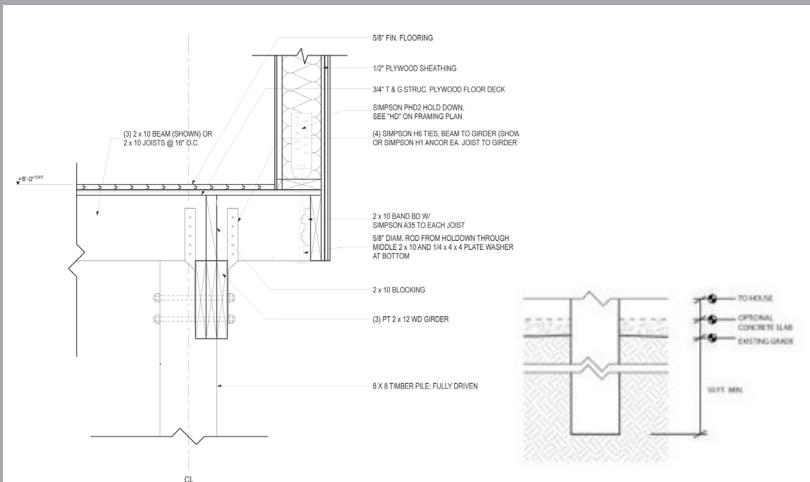
### Driven Wood Piles

This structural system, refined for East Biloxi through a collaboration of the contractors, engineers, and designers, was used on the Desporte, Robinson, and Odom homes. It has the ability to drive in most soils, does not disturb the natural soil condition and compaction, and doesn't require excavation.

Driven piles are about one third less expensive than the least expensive masonry foundation. The system is structurally strong and easy to detail to the floor system. Piles are driven at least 8 feet into the ground, sometimes deeper, depending on how high the home is elevated. This offers scour protection. Wood piles must be coated with either ACQ or CCA, both are types of wood preservative.

If desired, a flat concrete slab poured around the piles underneath the house will stiffen connections and offer additional protection against scour. The budget did not allow for this slab work in the initial construction phase, and the home remains extremely strong and safe without it due to the load on the piles being calculated with a safety factor of three.

Piles can be repaired cost effectively in the event of another catastrophic storm. The normal method is to cast a sister pile in concrete next to the original driven wood pile. This approach has become the preferred foundation method for the architects of the Gulf Coast Community Design Studio.



Robinson home, driven wood pile foundation detail. [Diagrams not to scale.]



# FLOOR SYSTEMS

Tran Home - Photo credit: Architecture for Humanity



Desportie Home - Photo credit: Architecture for Humanity



The Biloxi Model Home Program tested two different types of floor systems and several different floor materials. We found a stacked floor with a hold-down system offered a number of distinct advantages. We also tested a unique rotated tongue-and-groove subfloor that increased stability and saved money.

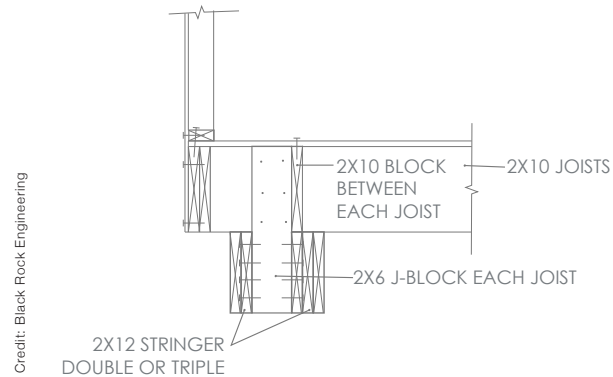
## In-Line Framing

This is the most typical system because it is the most straightforward in terms of following building code requirements. This system consists of beams and joists in the same plane, i.e., the joists are hung to the side of beams with galvanized joist hangers. The joist hangers serve as a hold-down connection and protect against joist roll.

## Stacked Floor with Hold-Down System

This system puts the beams below the joists so that the joists bear on top and do not hang from the side of the beam. This allows for much greater flexibility in creating the layout of the home. Outdoor decks can often be integrated on the same beams on which the home bears. This method also creates an alternative hold-down and roll protection system by creating a block that holds down each individual floor joist at each beam. We named this block the Jimbo block after contractor James "Jimbo" Carr of Cox & Carr Construction, who used this system in the Gulf Coast community of Galveston, Texas.

Black Rock Engineering, Architecture for Humanity, the Gulf Coast Community Design Studio, and local contractors collaborated to refine the detail for the hold-down block in various structure locations.



Detail of Jimbo block. [Diagram not to scale.]

## Tongue-and-Groove Subfloors

Chung Nguyen of MC<sup>2</sup> Architects used a flooring system in which a 2x6 pine tongue-and-groove subfloor, rotated 45 degrees to the joists below, is used as the finished floor. This diagonal orientation created an attractive visual effect while minimizing material and increasing lateral stability.

## Engineered Lumber

Engineered lumber is desirable for its highly predictable dimensional regularity and its load-bearing efficiency. It is also sustainable, as it is made of recycled wood products. Engineered lumber is more expensive, but a small cost saving is realized because less is required to build an equivalent product and because the timber does not warp or bend when its moisture content fluctuates. Over time, engineered wood is likely to become cheaper in the marketplace as raw wood resources become more expensive.

We used engineered timber in the floor systems of the Parker and Desporte homes. The use of engineered TJI, and timber I-joists allowed us to frame at 19.2" OC rather than 16" OC and allowed large cantilevers in the Desporte project.



Nguyen Home - Photo credit: Architecture for Humanity



Parker Home - Photo credit: Architecture for Humanity



Nguyen Home - Photo credit: Architecture for Humanity

# WALL ASSEMBLIES

Elevated homes typically sit on top of piers that are anchored into the ground, leaving the house vulnerable to uplift or rotation under high winds. The design and engineering team for MC<sup>2</sup> Architects created a design that extends the piers up the height of the exterior walls, strengthening the house and creating more direct load paths. This system was also used on Brett Zamore's design of the Parker home.

This wall assembly was designed by Carlos Gutierrez, PE, of CSF Engineering Inc and Chung Nguyen of MC<sup>2</sup> Architects, both in Houston, Texas.

The system combines a uniform and a point load system. The uniform load is the typical platform-framed stud wall, and the point loads are the 6x6 columns running between sections of the stud walls to the top plate. The columns extending up from the ground become a part of the stud wall and transfer the load directly to the foundation. The columns stiffen the connection from walls to floors and, below the floor system, they integrate strategic points for bracing the house.

This type of assembly requires 2x6 framing for the exterior walls. This allows room to insulate to R-19, a higher value of insulation than required.

We believe this assembly creates more direct load paths, which make stronger wall assemblies for elevated homes in hurricane-prone areas.



Parker home - Photo credit: Architecture for Humanity



Tran home - Photo credit: Architecture for Humanity

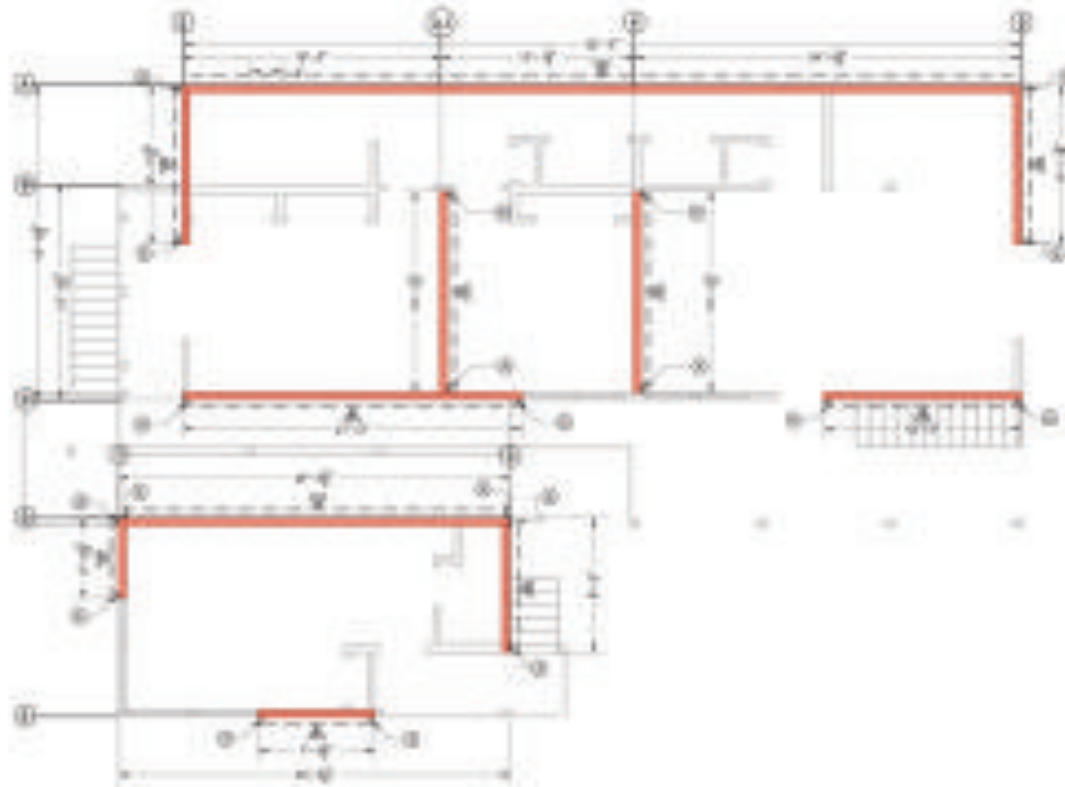
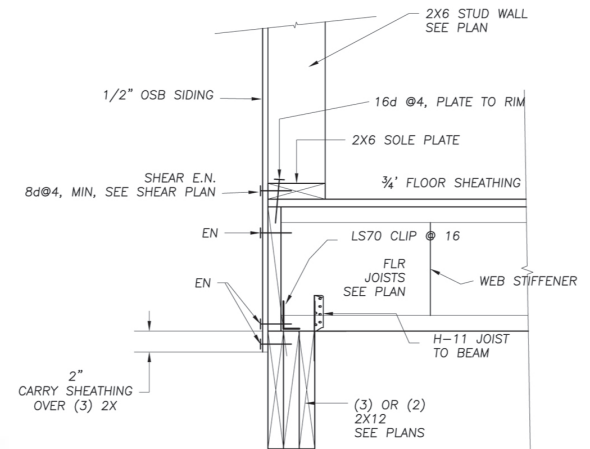


Nguyen home - Photo credit: Architecture for Humanity

# SHEAR WALLS


Shear walls have become commonplace in the residential construction lexicon in Biloxi. Shear walls are built to help stiffen a home against lateral loads, such as wind. Shear walls, both exterior and interior, are vital to the structural performance of a home in this hurricane zone.

To allow for cross ventilation in Biloxi's hot summer weather, buildings are typically long and narrow. Because of the narrowness of the vernacular building type, interior shear walls are necessary to meet the hurricane force wind load rating of 140 mph.



SCHEDULE I SHEATHING AND NAILING				
SHEAR WALL TYPE	SHEATHING THICKNESS	NAIL SIZE	NAIL SPACING EDGE FIELD	ADDITIONAL COMMENTS
6	1/2"	10d	6" O.C. 12" O.C.	
4	1/2"	10d	4" O.C. 12" O.C.	
3	1/2"	10d	3" O.C. 12" O.C.	USE 4x STUDS AT ADJOINING PANEL EDGES
2	1/2"	10d	2" O.C. 12" O.C.	USE 4x STUDS AT ADJOINING PANEL EDGES
44	1/2" BOTH SIDES	10d	4" O.C. 12" O.C.	USE 4x STUDS AT ADJOINING PANEL EDGES
33	1/2" BOTH SIDES	10d	3" O.C. 12" O.C.	USE 4x STUDS AT ADJOINING PANEL EDGES
22	1/2" BOTH SIDES	10d	2" O.C. 12" O.C.	USE 4x STUDS AT ADJOINING PANEL EDGES

**SHEAR WALL NOTES:**

- USE APA RATED SHEATHING (PS 1-83) STRUCT 1 OR BETTER. USE EXTERIOR GRADE WHERE APPLICABLE.
- NAILS SHALL BE COMMON OR GALVANIZED BOX.
- USE STUDS AT 16" O.C., U.N.O.
- BLOCK ALL PANEL EDGES.
- USE 10d COMMON NAILS FOR ALL SHEAR WALL NAILING. MIN SHANK DIAMETER 0.128", MIN PENETRATION OF 1.5" INTO STUDS.
- NAIL HEADS ARE NOT TO PENETRATE PLYWOOD.
- PROVIDE EDGE NAILING TO ALL STUDS WHICH HOLD HOLLOWDOWN HARDWARE.
- USE 3x SILL PLATE FOR WALLS GREATER THAN TIGHTER BOLT SPACING CAN BE USED WITH 2x SILL. SEE TABLE. 

Desporte Home shear wall plan (shear walls marked in red) and cross sections. [Diagrams not to scale.]

# ROOF ASSEMBLIES



Nguyen Home - Photo credit: Architecture for Humanity

## Roofing Details

In order to maintain our budgets, we felt it was important to not reinvent the wheel when it came to roofing assemblies. Roofs were built with typical off-the-shelf materials. Main materials used here were 2x dimensional lumber framing and manufactured wood trusses. The choice between the two simply depended upon performance and budget considerations.

## Sheathing

We required at least a 5/8" sheathing for the roof deck.

For shallow sloped roofs, we chose to use a higher-performing synthetic roof underlayment.

For typical roof pitches (4"x12" to 8"x12"), we used 30-year architectural asphalt shingles.

Where pitches were too steep or too shallow, we selected screw-down metal panels.



Parker Home - Photo credit: Architecture for Humanity



Parker Home - Photo credit: Architecture for Humanity

## Overhangs

The need for overhangs was a subject of debate among the Biloxi Model Home architects and builders. One view was that the homes needed overhangs to shade and cool the buildings in the hot climate of the Gulf Coast, even though overhangs can make the home more susceptible to uplift forces. Others thought safety considerations overruled the need for shade, opting for designs without overhangs.

Both the Parker home and the Odom home feature south side shading but solve the design problem differently (see photos at right).

Ultimately, the question of how to provide shade while keeping the home wind resistant came down to a question of budget. The design problem can be solved technically. But the real challenge, and the reoccurring lesson of this program, is how to solve design problems technically while balancing the constraints of budget, context, and sustainability.

## Venting

Venting attic spaces has been a standard practice for a very long time. Venting allows for air flow and a more balanced temperature and humidity level between outside and inside attic space. We found, however, that this practice is not necessarily better for affordable homes along the Gulf Coast for several reasons.

The HVAC equipment and HVAC duct work are often located in the attic space. On very hot humid days, the HVAC system works in a hot, harsh environment, increasing wear and tear on the equipment.

Locating the HVAC equipment and duct work in the attic means that dew and condensation can collect in the middle of the wall structure and also along the duct work. To address this concern, in some cases we chose not to vent the attic space, making a tight vapor barrier around the entire envelope of the house and addressing all possible infiltration points.

In the Gulf Coast climate, this approach lowers the moisture content of the interior air while still allowing the house to breathe.

We found the use of a soy-based spray foam insulation to be optimal for homes in this area. It allowed us to create a moisture-tight envelope but didn't create a moisture problem on the interior of the house.

Unwanted moisture on the interior of the home is most often the result of too tight construction, which doesn't allow the HVAC system to effectively dehumidify the inside air.

Parker Home - Photo credit: Architecture for Humanity



Odom Home - Photo credit: Leslie Schwartz/  
Architecture for Humanity



Photo credit: Architecture for Humanity



# EXTERIORS

## Durable, Affordable Siding Materials

We have yet to find a match in price or performance to cement fiberboard siding from James Hardie Building Products. It is durable, easy to maintain, and can take a beating from storm events. Cement fiberboard siding was the primary siding for six of the Biloxi model homes and was used on the seventh but not as the primary exterior finish.

We found that vinyl siding was not a preferred building material along the Gulf Coast due to issues of maintenance and lack of structural capability. The product can break down in harsh UV light, common to this area of the coast. In performing cleanup after the hurricane, we found that vinyl siding made up a large portion of the debris.

## Doors and Windows

We found we had many durable, affordable choices within the existing marketplace for doors and windows. We focused on off-the-shelf or easily manufactured, affordable selections from companies such as Mayfair and ThermaStar by Pella, that met the required pressure ratings for wind loads and energy efficiency.



## The Issue of Impact-Resistant Windows

The hurricane code requires all glass to be impact resistant. If nonimpact resistant glass is used, then the code requires operable shutters. If shutters are not used, homeowners nail plywood sheathing over glass windows for debris protection in the event of a hurricane.

We generally found that the cost of operable shutters or impact resistant glass was too high for the homes in this program. The shutters specified for the Tyler, Tran, and Nguyen homes are more integral to the design, and as of this printing, we are attempting to find a way to afford shutters for these homes. The design and height of the glass windows on these homes makes it difficult to nail plywood over the glass.

## Clerestory Windows

Clerestory windows keep UV and solar heat gain down and make artificial lighting unnecessary during the day. The Robinson home has clerestory windows, which allows natural daylight to be diffused throughout the building. This makes the home not only more inviting but also more energy efficient. Polycarbonate windows are impact resistant and do not require plywood sheathing in the event of a hurricane.

There is normally not room in the budget for this kind of premium window. Their use here was made possible through a generous in-kind donation from DuoGard.

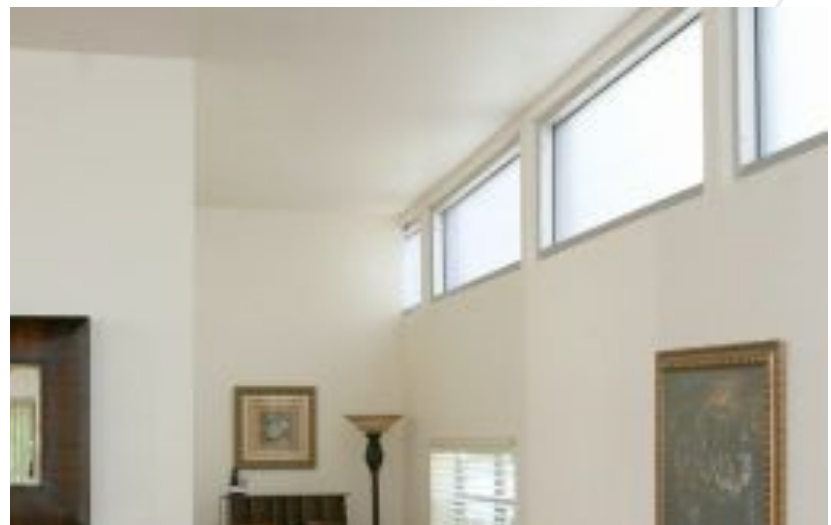
Odom Home - Photo credit: Leslie Schwartz/Architecture for Humanity



Robinson Home - Photo credit: Architecture for Humanity



Robinson Home - Photo credit: Leslie Schwartz/Architecture for Humanity



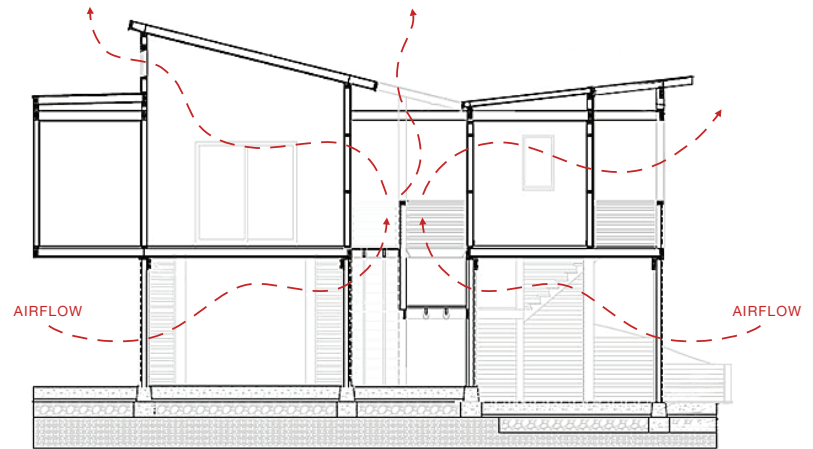
# INDOOR AIR QUALITY

Along the Gulf Coast, we found there was a heightened sense of awareness of the issue of indoor air quality (IAQ) due to the now infamous FEMA trailers. The concern is over firsthand exposure to airborne formaldehyde and other gas and particle emissions from certain types of finish materials.

Bad ventilation can exacerbate the problem of poor indoor air quality by not mixing outdoor air to help dilute indoor air.

High heat and humidity also compound the effects of airborne particles and chemicals.

Credit: Gulf Coast Community Design Studio/Architecture for Humanity



**Above and below:** Diagrams of the Parker and Desporte homes illustrating the usefulness of central open spaces to increase airflow.

Credit: Brett Zamore Design



## Interior Finishes

As with windows and doors, the current marketplace offers a multitude of options for indoor finishes. Our focus remained on balancing sustainability, indoor air quality, and affordability.

We used a simple and cost-effective engineered bamboo snap-lock flooring system. These bamboo floors float, eliminating the need for mechanical fasteners or glues. And bamboo is a renewable resource.

Carpet was used in only one home, and the carpet chosen was made from recycled materials and had low volatile organic compound (VOC) emissions.

Ceramic tile was chosen for bathrooms and wet areas. Ceramic tile is highly durable, maintains easily, and does not contribute to poor indoor air quality. Mold and mildew tend not to grow on its surface.

We chose low odor, low-VOC paint, a simple and inexpensive alternative to traditional paints, which can contribute to poor indoor air quality.

**Right:** The Parker family with designer Chris Madden, center, in denim jacket. **Below left:** The Parker home's finished kitchen. **Below right:** The Parkers in their dining area, with furniture from the Chris Madden for JC Penney Home Collection.

## Furnishings

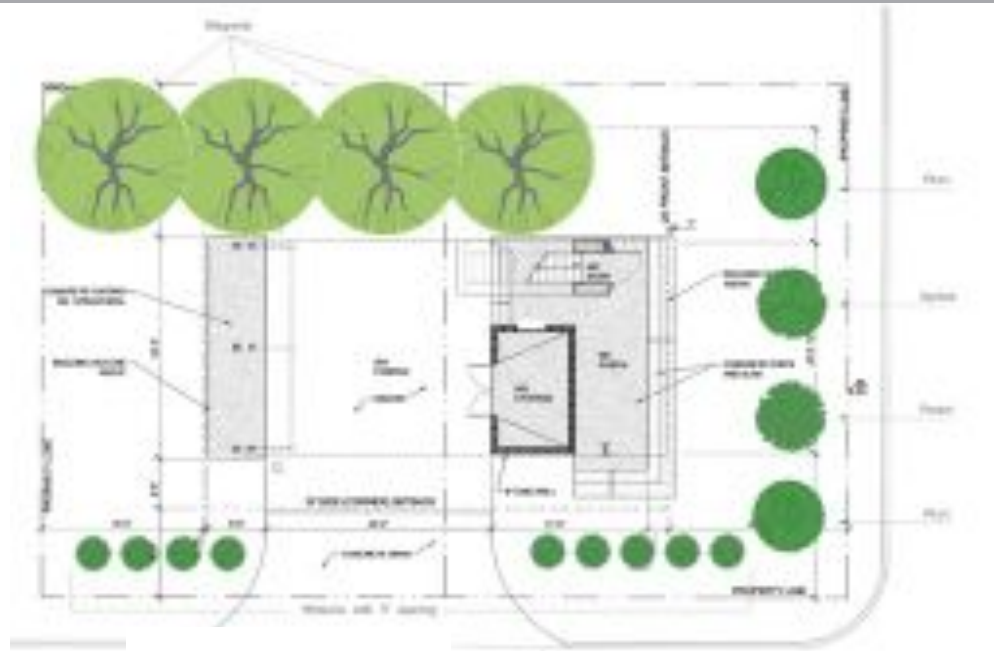
The families of the Biloxi Model Home Program lost nearly all of their belongings during the storm, including their furniture. Furniture was either damaged beyond repair or had to be thrown out due to mold infestations. Designer Chris Madden donated furniture from the Chris Madden for JC Penney Home Collection to three of the families in the Biloxi Model Home Program. Stylists from Chris Madden Inc worked with these three families to choose designs that would suit the smaller scale and overall look of each of the homes. "We listened to their needs and cherry-picked from the collection to find the pieces that would work," says the firm's design director, Carolyn Schultz.

Designer Chris Madden, who traveled to Biloxi in April 2007 to meet with the families, knows the importance of putting clients' needs first. "Don't assume anything. Don't assume you know what's right for anyone. Talk to them, find out what their needs are. And be ready for anything... The one thing that people should be prepared for when they come to East Biloxi is a life-changing experience. You don't just stop here."



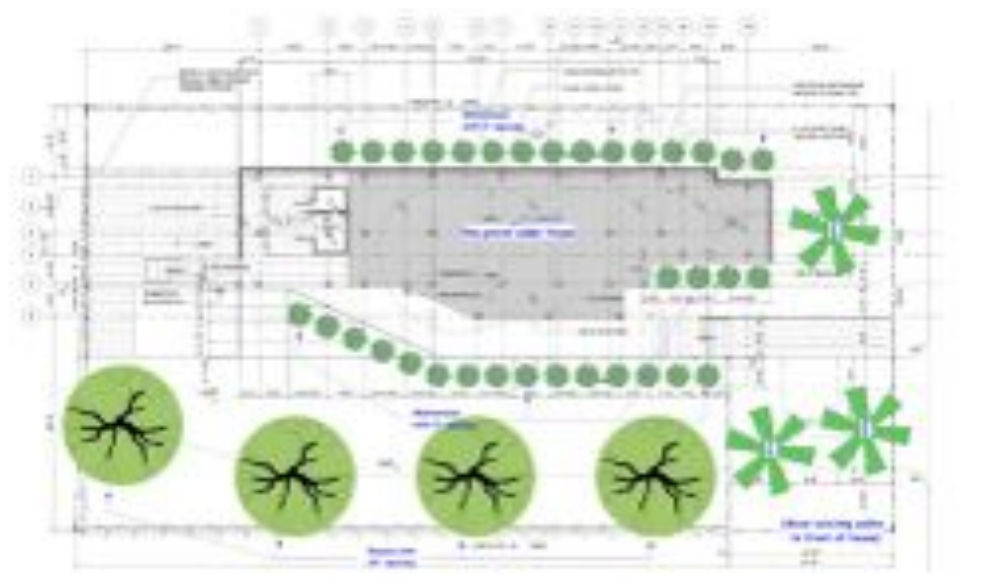
# LANDSCAPE ARCHITECTURE

Tyler Home - Credit: Paul Hendershot Design



Magnolia Tree

Robinson Home - Credit: Paul Hendershot Design



Pecan Tree

The families of the Biloxi Model Home Program received valuable help from landscape professionals and other volunteers to make the outside of their homes as welcoming as the inside.

Landscape designer Paul Hendershot of Paul Hendershot Design in Ojai, California, visited East Biloxi in the June 2007 to donate landscape design services to six of the seven families in the program. Hendershot approached the Biloxi Model Home Program landscape design as he would any other design problem, by first interviewing each of the families and determining their needs and desires. Issues of affordability, sustainability, and long-term maintenance played into his design choices. “Some families wanted shade most of all; some had trees already and didn’t want any more shade. Some wanted fruit trees, others wanted zero fruit trees—everybody wanted something different... I worked really hard to use what grew well and make it blend with the rest of the neighborhood.”

From client interviews, Hendershot determined that most desired a more traditional look for the landscape. “They didn’t relate to modern landscapes—the flax, the grasses. We were going from an older style. These are definitely not modern contemporary landscapes at all. I think it would have been out of the comfort zone to choose a really modern scape.” Hendershot chose plants that blended with the exterior finishes of each home.

Hendershot researched hardy local plants such as *Malvaviscus* and *Hibiscus syriacus* “Rose of Sharon” and used them liberally in his designs. “*Malvaviscus* grows like a weed in the area. I have always loved that plant. It has little orange flowers, and it’s just beautiful. You can shape it too; I used it for hedge materials.”

One important challenge was the homes’ elevations. Hendershot viewed this as a design opportunity. “If you stand under the house, it’s the coolest place. It’s cooler there even than on the porches. We chose a simple pea gravel patio to sit in underneath the houses.”

For additional shade, Hendershot chose the types of trees that had survived the hurricane and grew in the neighborhood: magnolias, pecans, oaks.

The Nguyen family’s love of gardening was inspiring to the designer. “The Nguyens were cool because they were so into food. They really had a sense of what they wanted. The kids got involved—I could tell they loved veggie gardening, so I asked, ‘Should we make the garden bigger?’ I told them that for privacy, they could have trees for food, and the kids started saying all the fruits they liked.”

The care in choosing appropriate landscaping extended back to participating architects as well. Brett Zamore Design created the landscape plan for the Parker home; and plants for the Parker home were donated by Newton Nursery in Houston, Texas.

American Forests and the Mississippi Land Trust generously donated trees for the Biloxi Model Homes.

Parker home - Photo credit: Leslie Schwartz/Architecture for Humanity



Nguyen garden - Photo credit: Leslie Schwartz/Architecture for Humanity



# RESOURCES

## Materials Resources

Benjamin Moore Eco Spec Paint: [www.benjaminmoore.com](http://www.benjaminmoore.com)

BioBased soy spray-foam insulation: [www.biobased.net](http://www.biobased.net)

Blinds.com: [www.blinds.com](http://www.blinds.com)

CaesarStone countertops: [www.caesarstoneus.com](http://www.caesarstoneus.com)

Chris Madden for JC Penney Home Collection  
[www.chrismadden.com](http://www.chrismadden.com) and [www.jcpenney.com/chrismadden](http://www.jcpenney.com/chrismadden)

Dal Tile: [www.daltile.com](http://www.daltile.com)

Duo-Gard Industries windows: [www.duo-gard.com](http://www.duo-gard.com)

James Hardie Building Products, HardiePlank siding  
[www.jameshardie.com](http://www.jameshardie.com) and [www.jameshardiecolorplus.com](http://www.jameshardiecolorplus.com)

Kohler Co. plumbing fixtures: [www.kohler.com](http://www.kohler.com)

Nourison Rugs: [www.nourison.com](http://www.nourison.com)

Pile Driving Contractors Association: [www.piledrivers.org](http://www.piledrivers.org)

Senox Corp gutters: [www.senox.com](http://www.senox.com)

## Government Resources

Congressional testimony by Sherry-Lea Bloodworth, formerly of Architecture for Humanity, about housing recovery efforts in Mississippi  
<http://republicans.transportation.house.gov/Media/File/TestimonyEDPB/06-19-08-Bloodworth.pdf>

Economic Rationale for Elevation Freeboard  
[www.anrc.arkansas.gov/Rationale%20for%20Elevation%20Freeboard.pdf](http://www.anrc.arkansas.gov/Rationale%20for%20Elevation%20Freeboard.pdf)

Environmental Protection Agency ACQ wood preservative information  
[www.epa.gov/oppad001/reregistration/cca/acq.htm](http://www.epa.gov/oppad001/reregistration/cca/acq.htm)

Environmental Protection Agency mold information  
<http://epa.gov/mold/moldresources.html>

FEMA Advisory Base Flood Elevation (ABFE) guidelines for coastal areas  
[www.fema.gov/hazard/flood/recoverydata/katrina/katrina\\_ms\\_harrison.shtm](http://www.fema.gov/hazard/flood/recoverydata/katrina/katrina_ms_harrison.shtm)

FEMA Gulf Coast Recovery Office  
[www.fema.gov/hazard/hurricane/2005katrina/index.shtm](http://www.fema.gov/hazard/hurricane/2005katrina/index.shtm)

FEMA Home Builder's Guide to Coastal Construction Technical Fact Sheets  
[www.fema.gov/rebuild/mat/mat\\_fema499.shtm](http://www.fema.gov/rebuild/mat/mat_fema499.shtm)

FEMA Hurricane Information Page  
[www.fema.gov/hazard/hurricane/index.shtm](http://www.fema.gov/hazard/hurricane/index.shtm)

FEMA's Hurricane Katrina in Mississippi Website  
[www.fema.gov/news/event.fema?id=4807](http://www.fema.gov/news/event.fema?id=4807)

FEMA National Flood Insurance Program  
[www.fema.gov/about/programs/nfip/index.shtm](http://www.fema.gov/about/programs/nfip/index.shtm)

FEMA Recommended Residential Construction for the Gulf Coast  
April 2006 lecture: "Building on Strong and Safe Foundations"  
[www.governorbarbour.com/recovery/links/documents/FEMA550.ppt](http://www.governorbarbour.com/recovery/links/documents/FEMA550.ppt)

FEMA's Tips for Reducing Future Flood Damage  
[www.fema.gov/hazard/hurricane/2005katrina/build\\_safer.shtm](http://www.fema.gov/hazard/hurricane/2005katrina/build_safer.shtm)

HUD Fair Housing Accessibility Guidelines  
[www.hud.gov/offices/fheo/disabilities/fhefhag.cfm](http://www.hud.gov/offices/fheo/disabilities/fhefhag.cfm)

Occupational Safety & Health Administration: [www.osha.gov](http://www.osha.gov)

Office of the Federal Coordinator for Gulf Coast Rebuilding  
[www.dhs.gov/xprepresp/programs/editorial\\_0816.shtm](http://www.dhs.gov/xprepresp/programs/editorial_0816.shtm)

SSTD10-99 Standard for Hurricane Resistant Construction  
available from the Southern Building Code Congress International (SBCCI)

US Census Bureau Katrina information page  
<http://www.census.gov/Press-Release/www/2005/katrina.htm>

US Department of Energy, Energy Star program: [www.energystar.gov](http://www.energystar.gov)

## Disaster Mitigation Resources

Coordinated Assistance Network (case management): [www.can.org](http://www.can.org)

Gulf Coast Community Foundation and Gulf Coast Association of Housing  
Recovery Centers: (228) 897-4841

Governor's Office of Renewal and Recovery housing information page  
[www.governorbarbour.com/Recovery/issues/housing/#general](http://www.governorbarbour.com/Recovery/issues/housing/#general)

Governor Barbour's comprehensive plan for Gulf Coast housing  
[www.governorbarbour.com/Recovery/news/2006/sep/GHBcomprehensivehousingplan.htm](http://www.governorbarbour.com/Recovery/news/2006/sep/GHBcomprehensivehousingplan.htm)

Homeowner Grant Program from the Mississippi Development Authority  
[www.mshomehelp.gov](http://www.mshomehelp.gov)

Living Cities recommendations for rebuilding East Biloxi  
[http://www.livingcities.org/pdf/Biloxi\\_Final\\_Report.pdf](http://www.livingcities.org/pdf/Biloxi_Final_Report.pdf)

Migration patterns and move characteristics from the 2005 ACS Gulf Coast survey  
[http://www.census.gov/Press-Release/www/emergencies/gulf\\_migration.pdf](http://www.census.gov/Press-Release/www/emergencies/gulf_migration.pdf)

Mississippi Emergency Management Authority: [www.msema.org](http://www.msema.org)

Mississippi Renewal Forum: [www.mississippirenewal.com](http://www.mississippirenewal.com)

Mississippi Emergency Management Authority: [www.msema.org](http://www.msema.org)

## Other Resources

Center for Independent Living: [www.cilberkeley.org](http://www.cilberkeley.org)

Center for Universal Design, College of Design, North Carolina State University  
[www.design.ncsu.edu/cud/about\\_ud/udprinciples.htm](http://www.design.ncsu.edu/cud/about_ud/udprinciples.htm)

Global Green USA green rebuilding program in New Orleans  
<http://www.globalgreen.org/neworleans>

National Aging in Place Council: [www.naipc.org](http://www.naipc.org)

US Green Building Council: [www.usgbc.org](http://www.usgbc.org)

Universal Design Features in Housing from the Center for Universal Design  
[www.design.ncsu.edu/cud/pubs\\_p/docs/UDinHousing.pdf](http://www.design.ncsu.edu/cud/pubs_p/docs/UDinHousing.pdf)

## Program Partners

Architecture for Humanity: [www.architectureforhumanity.org](http://www.architectureforhumanity.org)

The Gulf Coast Community Design Studio: [www.gccds.org](http://www.gccds.org)

Hands On Gulf Coast: [www.handsongulfcoast.org](http://www.handsongulfcoast.org)

Hope Coordination Center (The East Biloxi Coordination, Relief, and Redevelopment Agency): (228) 435-7180

The Open Architecture Network: [www.openarchitecturenetwork.org](http://www.openarchitecturenetwork.org)

Warnke Community Consultants: [www.warnkecc.com](http://www.warnkecc.com)

**For more information about each home in the Biloxi Model Home Program, including renderings, construction photos, program documentation, please visit the Open Architecture Network: [www.openarchitecturenetwork.org/biloxi](http://www.openarchitecturenetwork.org/biloxi)**



Photo credit: Architecture for Humanity

**Above:** Ray Huff of Huff + Gooden Architects, left, with clients Audrey and Andre Robinson at the program's closing celebration in July 2008.

“THIS WASN’T JUST AN IDEAS  
FOR HUMANITY WAS COMMI  
DESIGN ON ITS OWN TERMS,  
BUDGET. THEY WERE SINCER  
MODEL THAT CAN BE REPEAT  
THEY NEVER WAVERED, AND  
—MARLON BLACKWELL, ARC

PROGRAM. ARCHITECTURE  
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E IN THEIR SEARCH FOR A  
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WE DIDN'T EITHER.”  
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CONCLUSIONS

# FINAL THOUGHTS



Photo credits: Leslie Schwartz/Architecture for Humanity

**LESSONS LEARNED** Innovation is valuable only as it is shared. In this spirit we gathered the lessons of the Biloxi Model Home Program.

**FINANCING** In the aftermath of the storm government agencies in particular, but also private NGOs (Non-Government Organizations) and funders, struggled to distribute funds to families very much in need. The primary obstacle was the lack of a local fiduciary agent. It took more than nine months to develop the Forgivable Loan Program and create such a channel in East Biloxi.

We couldn't help but ask what if communities in disaster-prone areas took the initiative to set up local economic development corporations and funding conduits in advance of disasters rather than waiting until afterwards to create these tools? This simple step would have allowed them to take control of the rush of funds that tends to come in the immediate wake of disaster – and therefore be less reliant on distant agencies to take control of the housing reconstruction effort.

Many decisions were made about how the recovery effort should be administrated based on legal and financial conventions dictated by others. This greatly slowed the process and created a gap in accountability. Local control and local knowledge are needed to distribute funds quickly and fairly. Moreover, without a local agency taking control of combining and distributing funds from private and government sources, financing the construction of a whole house becomes impossible. Families are left

to coordinate that effort on their own, and funders are left in the dark about where funding is most needed, often donating to families based on profile information unaware that this family has already received the needed funding, whilst the family next door is left waiting - unable to begin construction.

**CASE MANAGEMENT** We encourage communities prone to disaster to offer training to local leaders in the establishment and use of case management systems. Again, a common database to be used by the many relief agencies, volunteer groups, community groups, housing developers, government authorities and others who participate in most rebuilding efforts should be established in advance rather than after disaster hits. The Coordinated Assistance Network ([www.can.org](http://www.can.org)) offers such a database and has put in place privacy controls. Second to a local fiduciary agent, the establishment of a sound shared case management platform is critical to supporting community-based reconstruction.

**COLLABORATION** Recovery depends on an ecosystem of experts working in symbiosis. Many funders shied away from funding the partnership that made the Biloxi Model Home Program possible. They feared funding multiple implementing agents rather than a single agent would lead to a lack of accountability, and there were moments early on when we feared they would be right. In retrospect the opposite was true. Funding agents should look for coalitions of local partners and/or agencies with specialized expertise. Funding a group of organizations provides inherent accountability



as each will act as a check on the other. In addition it prevents redundant efforts by opening lines of communication, allows specialization that can lead to efficiencies and offers opportunities for synergies.

**FLEXIBLE FUNDING** Flexible funding is critical to supporting market-based recovery efforts and local economies. As we entered year two of the program it was widely thought that the availability of federal funding and matching gap financing from private groups would spur contractors to come to the area to meet the demand for construction. This was slow to happen. Partly because infrastructures and commercial projects absorbed the local supply of labor but also because of the controls placed on the way funds were distributed. Cumbersome “material grants” and “gap” funds meant that families needed to provide detailed construction documentation before receiving the funds needed to hire a contractor who might provide that information. It was a catch 22. While “material grants” might be appropriate for volunteer-run building projects, a typical small contractor, used to costing and procuring materials for jobs, did not have the patience or administrative bandwidth to help clients secure and manage these grants. Cash or open vouchers would have sped the process.

Future recovery efforts should consider supporting general contractors (be they non profit or for profit) to provide construction financing to their clients in return for warranties on the building work. This also allows recovery groups to build block-by-block rather than house-by-house. Bringing back whole blocks offers security and stability to the neighborhood.

**COMMUNITY DESIGN STUDIO** The Gulf Coast Community Design Studio played a critical role in spearheading the recovery effort in Biloxi. Beyond the Biloxi Model Home Program, Architecture for Humanity experimented with several approaches to bringing design services to the Gulf Coast in the wake of Hurricane Katrina. They ranged from supporting local firms of architects working remotely with individual households, to funding community design studios within recovery organizations, to various combinations of both.

**URBAN PLANNING** Planning that recognizes the existing structures rather than treating the disaster-affected area as a blank slate is critical. Urban planning initiatives can create uncertainty and anxiety in families already grappling with difficult decisions and coping with grief. Surveys that provide detail damage assessment with household level financial and need assessments provide useful information that can be shared and acted upon by a wide range of groups. This micro-level planning effort 1) allows planners to gauge families’ intentions to remain in the community rather than relocate, 2) enables planners to assess the ability of families to self-fund the reconstruction of their homes either through savings or insurance, 3) helps planners understand which homes were owned versus rented and which have a clear land title—all factors that significantly impact rebuilding, and 4) enables the prioritization of the reconstruction of streets and blocks based on need and readiness to return rather than simply financial means.

# FINAL THOUGHTS



A few of the volunteers and homeowners involved in the Biloxi Model Home Program Photo credits: Leslie Schwartz/Architecture for Humanity

By far the most effective approach was the establishment of a community design studio within a local recovery organization. Local firms were quickly overwhelmed with commercial project. Remote services did not allow for critical construction oversight. Both were difficult to scale. The design studio allowed for a wide range of services to be available to a broader constituency at a fixed cost. It supported micro-planning, volunteer participating and integrated case management. We estimate the cost of design services per household between the three approaches as follows:

Cost Per Household	Percent of Construction	Design Services Model
\$1,500	2%	Design Studio (Design professionals only)
\$4,800	7%	Design Studio (Design professionals, students and volunteers)
\$5,000	3%	Remote/Single Firm (Pro-bono; travel and out-of-pocket expenses only)
\$10,000	7%	Hybrid (Design studio, individual firms, volunteers, )
\$10,400	10%	Design Studio (Including volunteer coordination, case management, construction management)

Please note: All costs are approximate and are based on annualized costs, averaged construction values and beneficiary information provided to Architecture for Humanity in grant reports from partners we funded over the course of three years.

Community design studios can be based within a firm, community group,

university (but only if allowed to depart from academic calendars and curriculum requirements), and should partner with organizations providing case management.

**DESIGN** In the three years since the storm, we have acquired important technical know-how relating to constructing hurricane-resistant homes at elevation. The program has explored several new construction methods that improve structural integrity, sustainability, and cost-efficiency for new homes along the Gulf Coast.

Working with homeowners we found creative ways to stay within our tight construction budgets and gained valuable knowledge about what is and isn't affordable. The solutions devised through this process have directly influenced the design and construction of other new homes in the region and the work of the Gulf Coast Community Design Studio. They include:

- Adopting driven wood piles as a standard foundation system for elevated homes in East Biloxi
- Testing a system to extend foundation piles up through the wall to better transfer loads to the foundation
- Developing a diagonally-laid tongue-and-groove floor system that increases lateral stability
- Refining a standard block system to hold down floor joists at beams and protect against roll
- Standardizing optimum placement of interior shear walls to stiffen against lateral loads in long, narrow homes



- Committing to the use of spray soy-foam insulation for gains in energy efficiency
- Exploring methods to improve the integration of a wheelchair ramp into a home's design

In general we found that a design strategy that embraced common construction practices, be they traditional or modular, was more productive and cost effective as it created fewer delays between the design team and contractor in trying to explain new ideas. Innovation in construction approaches is valuable, but not in the first construction season where the need to quickly reintroduce a sense of normalcy is critical. Three of the Biloxi Model Homes were significantly delayed by the difficulty of costing new construction approaches. Whatever design savings may have been achieved were lost to soft programming costs caused by a longer design development phase.

**CONSTRUCTION** Identifying and retaining construction management expertise is critical. We did not hire a construction manager or general contractor to lead the construction effort, choosing instead to support local construction firms. While not conclusive, due to the complexity of managing material grants and threaded financing, approaching the program as a design/build project may have been more effective.

**HOMEOWNER INSURANCE** in the aftermath of the storm, insurers struggled to communicate clear building standards. We had hoped that by building to the proposed elevation standards we would be able to reduce resident

insurance premiums. Lack of clarity from the insurance industry, which adopted different standards, may prevent some or all of our homeowners from realizing these savings. Legislation could require insurers to adopt the same building standards as regulatory agencies. Linking insurance savings to building requirements might offer an incentive to adhere to new building codes and regulations even as these are in flux.

**FINAL THOUGHTS** The Hope Coordination Center with its partners have together rebuilt more than 35% of East Biloxi in the three years since the storm. The Hope Coordination Center is now the permanent home to more than 20 agencies, including the design studio, financial consultants, economic development consultants, and a number of faith-based groups. The innovative revolving loan fund is now beginning to recapture between 20% to 90% of the cost of constructing new homes, freeing funding to assist more families and seeding a long-term economic development fund that we hope will serve East Biloxi for years to come. More telling still, the model of pairing community members with professional designers—and the strategy of locating a community design studio within a housing recovery center—is being replicated across the Gulf Coast.

The Biloxi Model Home Program and the work of the Hope Coordination Center and its partners are the physical embodiment of what is possible when people come together. We feel strongly – and all these homes show – that it is possible to build a safer, more sustainable home in the wake of disaster. We hope that the technical information and observations gathered here will guide future communities devastated by disaster. Welcome home, Biloxi.

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American Red Cross  
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HandsOn Network  
Hands On Gulf Coast  
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## IDTF

Interfaith Works  
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Hurricane Relief Corps  
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**I love the outside, the decks and porches. I'm a country girl; I like to sit outside... And I love the balcony off my bedroom—I have my coffee there in the morning and just take it in.**

Karen Parker, homeowner

**There's often a separation that happens between the architect and engineer and the contractor. But this is a process where everyone involved needs to have an equal seat at the table. What we need to do more of is talking about the intricacies of being on the ground, about how all these organizations work together to put people back home. That's what architects don't do every day... We need architects to understand the layers we have to muddle through to do disaster recovery on a large scale. An architect who can understand that is really, really valuable.**

Mike Grote, Biloxi Model Home Program Manager

**I would tell people to never give up when you're down and out. Someone came along and made me feel really special.**

Louise Odom, homeowner

The Biloxi Model Home Program is a model for bringing community groups, building professionals and relief agencies together to help families devastated by disaster rebuild their homes and their lives. In the wake of Hurricane Katrina, this award-winning collaboration has fostered the rehabilitation of hundreds of destroyed and severely damaged housing stock in one low-income, urban community.

The goal of the Biloxi Model Home program was to provide design services and financial assistance for the construction of homes for families in Biloxi, Mississippi whose houses were destroyed by Hurricane Katrina. To jump start the program, Architecture for Humanity invited twelve established local and national firms to create proposals for homes that meet the new challenges of disaster-mitigation in the post-Katrina environment.

Families were paired with a team of professional designers who work with them one-on-one to design a new home for their property that was not only affordable but also sustainable and met the area's new building requirements. Along the way the program brought much more to a community devastated by disaster.

In addition to providing design services, the Biloxi Model Home Program offered an alternative to traditional community development models. By coordinating volunteer efforts and combining integrated case-management and an innovative financing model with on-site design and construction services, the successful pilot program kick-started a larger-scale reconstruction effort—by working to rebuild home at a time.

*Rebuilding After Disaster: The Biloxi Model Home Program* offers insights into this unique community-based reconstruction effort. From early efforts to project financing, to design and construction lessons learned the book shows how community leaders and building professionals can work together to overcome hurdles and speed the reconstruction of communities after disaster. It is a powerful testimony to the power of communities to come together after disaster and rebuild on their own terms.

**FOR MORE INFORMATION PLEASE VISIT:  
<http://openarchitecturenetwork.org/biloxi>**

