Research Statement

Many housing providers are facing changes on the Gulf Coast. A reduction in volunteer labor and an increase in concern for structural strength and environmental responsibility are just some of the difficulties facing community builders. Many are beginning to question the way in which they provide housing.

The Gulf Coast Commmunity Design Studio (GCCDS) is developing a series of tools meant for those working with communities to meet new housing needs in their area. It is our goal that these binder dividers, along with the developing research they represent, introduce housing providers interested in construction systems to some alternatives. Hopefully, with increased knowledge, organizations will begin to feel more comfortable expanding the methods and materials they use to build homes and communities.

The GCCDS has focused our research on construction systems which have unusual performances and/or unique assemblies. We have tried to limit the discussion to building systems that seem reasonable for use regionally along the Gulf Coast, taking into consideration the availability, cost, performance, and suitability of a system. This is not meant to include all of the innovative construction systems that are available; this is meant to be merely an introductory guide to some of the systems being used along the Gulf Coast.

We produced a series of binder dividers representing the categories used in our ongoing research. Each category is summarized, including common practices and some alternatives we find promising. A matrix on the back of each divider represents the advantages and disadvantages we see in sub-categories of the subject. We encourage housing providers to take a set of dividers and start their own research binders.

The GCCDS will be publishing both web and hard copy versions of our larger research report this summer. The information available in this report will expand the basic introduction given here and in the binder dividers. For more information, please visit our website at http://www.gccds.org/.

whole house systems

- modular homes
- component homes
- kit homes
- hybrid homes

factory assembled homes

structural component systems

panels
- structural insulated panels
- composite structure insulated panels
- concrete panels

cast & stacked
- insulated concrete formwork
- concrete masonry units
- autoclaved concrete

framing systems
- traditional framing
- advanced framing
- engineered studs
- steel studs
- floor trusses
- roof trusses

small assembly systems

elevated foundations
- driven wood piles
- cast-in-place wood piles
- CMU piers
- chain walls
- poured concrete piers

flooring
- subfloors
- 2x6 tongue & groove
- pre-cast panels
- cast-in-place floors
- finishes

walls
- exterior finishes
- sheathing
- insulation
- interior finishes

roofing
- radiant barrier
- shingles
- tiles
- sheet metal
- green roof
- rubber

environmental systems

site work
- porous paving
- rain gardens & bio-swales
- rain water collection
- planting screens
- native plants

appendix
- insuring homes
- energy efficiency
- further research
- sources
- images

appendix
insuring homes
energy efficiency
further research
sources
images

framing

	construction process	speed	delivery method	required equipment	specialized labor	wind resistance	water resistance	fire resistance	thermal performance	life span	environmental impact	product versatility	market exposure	code approval	affordability	coastal considerations
traditional timber framing	+	+			+							+	+	+		
advanced wall framing						+			+							
engineered wood stud framing						+			+		+				−	
steel stud framing						+	+	+				−				
engineered wood floor trusses		+										−				
engineered steel floor trusses			+					+				+				
engineered wood roof trusses			+									+				
engineered steel roof trusses			+					+				+				

cast & stacked

	construction process	speed	delivery method	required equipment	specialized labor	wind resistance	water resistance	fire resistance	thermal performance	life span	environmental impact	product versatility	market exposure	code approval	affordability	coastal considerations
insulated concrete formwork		+		−		+			+			−			−	+
concrete masonry units	+	+			+			+				−				
autoclaved concrete	+		+	+	+			+			+	+	−	−		

panels

	construction process	speed	delivery method	required equipment	specialized labor	wind resistance	water resistance	fire resistance	thermal performance	life span	environmental impact	product versatility	market exposure	code approval	affordability	coastal considerations
concrete panels		+	−	−	−	+	+	+	−	+	−	−		+	−	+
structural insulated panels	+	+		+	+	+	+	−		+	+	+				+
non-wood structural insulated panels	+	+				+	+	+	+	+	+	−	−		−	+
framed panels	+	+		+	+	+	+	+	+	+	+		−			+

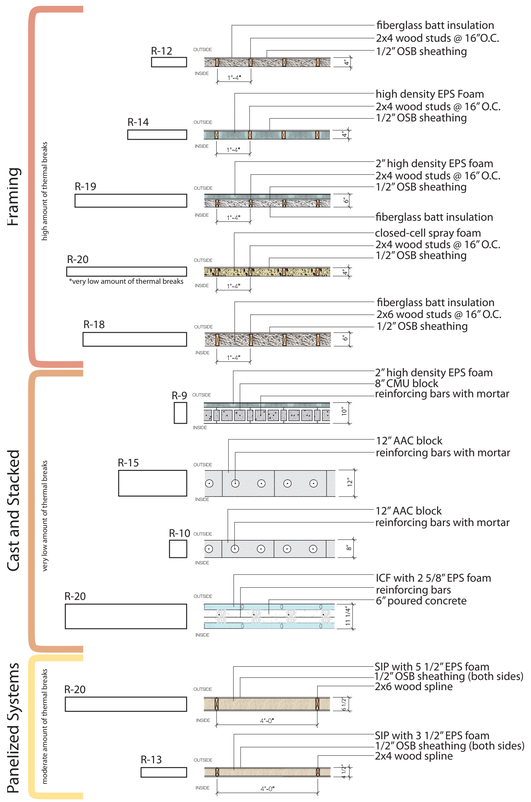
Insulation is one of the most important factors contributing to the energy efficiency of a building. The unit of measure of insulation performance is called the R-value (the rate of thermal resistance of an object or material). Generally, the thicker the insulation, the more resistance it will have to heat flow, and the higher its R-value. Thermal breaks, which reduce the efficiency of a wall, occur wherever insulation is not continuous (i.e., at every stud in a wood-framed wall). When this happens, conditioned air from the building's interior leaks out, and unconditioned air from the outside leaks in. The R-value of the wall will decrease if there are many thermal breaks.

The most efficient wall systems are designed to have a continuous layer of high-performing insulation. Depicted are examples of many different types of walls, with corresponding information regarding R-values and thermal breaks that occur within those systems. Because of variations in manufacturing, some values differ in practice.

factory-assembled homes

	construction process	speed	delivery method	required equipment	specialized labor	wind resistance	water resistance	fire resistance	thermal performance	life span	environmental impact	product versatility	market exposure	code approval	affordability	coastal considerations
modular homes	+	+	−	−	−							−	+	+	+	
component homes	+	+		−		−	+			+		+	−	−	−	−
kit homes	+	+		−	+							−	−		+	
hybrid homes	+	+	+	−	−							+	−	−	+	

Wall Systems - Thermal Performance

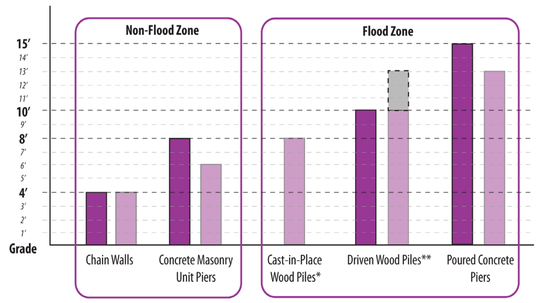


floors

	construction process	speed	delivery method	required equipment	specialized labor	wind resistance	water resistance	fire resistance	thermal performance	life span	environmental impact	product versatility	market exposure	code approval	affordability	coastal considerations
subfloors w/ finishes			+	+	+							+	+			
2x6 tongue & groove	−	−	+			+					+		−			+
pre-cast panels		+	−	−	−	+		+		+		−	−		−	
cast in place floors	+	+				+		+		+		+			−	

foundations

	construction process	speed	delivery method	required equipment	specialized labor	wind resistance	water resistance	fire resistance	thermal performance	life span	environmental impact	product versatility	market exposure	code approval	affordability	coastal considerations
driven wood piles	+	+		−	−	+	+					+	+	−	+	+
cast-in-place wood piles			+	+	+		+							−		
cmu piers			−	+	+	−	−	+					+			
chain wall		−	+	+		−		+				−		−	+	−
poured concrete piers		−	+	+	−	+	+	+		+		+	+		−	+

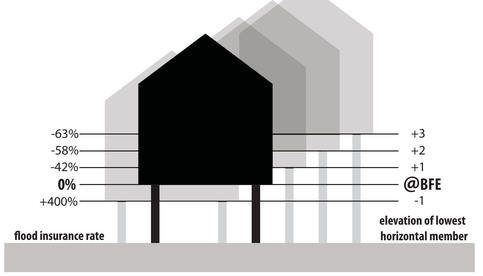


***Note:** Cast-in-Place Wood Piles Not Researched By FEMA*

****Note:** Consult Specialist if Elevating Piles Above 10'*

Houses constructed on the Gulf Coast must be built to withstand hurricane-force winds and potential flood waters, often ruling out slab-on-grade foundations. FEMA's new flood elevation requirements require homeowners to elevate new construction anywhere from 2' to 14' or more above grade, depending on the site's flood zone. Foundation systems like concrete masonry unit piers, driven wooden piles, or cast-in-place concrete piers should be used to loft the framing system to flood requirements.

The above graph shows suggested systems based on required elevation. Homeowners should consult with an architect or engineer to choose a foundation system that is appropriate for their elevation requirements. If the house is to be built with a nonstandard floor system, such as precast floor panels or cast-in-place concrete, the foundation system should be chosen accordingly.



Flood insurance rates can be pricey, and are not easy for homeowners to reduce. Rates are set by the National Flood Insurance Program, based on FEMA's Base Flood Elevation (BFE) maps. Material choices and flood-resistant building design do not affect insurance rates. However, new residences that build above the BFE a foot or more can save up to 63% off their annual flood insurance - a strong argument for lofting a house higher rather than lower. Any additional construction costs will be earned back in savings on flood insurance. (Source: NFIP)

site work

	construction process	speed	delivery method	required equipment	specialized labor	wind resistance	water resistance	fire resistance	thermal performance	life span	environmental impact	product versatility	market exposure	code approval	affordability	coastal considerations
porus paving	+		+	+	−					+	+	+	−			
rain gardens & bio-swales	+	+	+	+	+					+	+				+	+
rain water collection	+	+	+	+	+				+	+	+	+		−		
planting screens	+	−	+	+	+						+				+	
native plants									+	+			−		−	

roofs

	construction process	speed	delivery method	required equipment	specialized labor	wind resistance	water resistance	fire resistance	thermal performance	life span	environmental impact	product versatility	market exposure	code approval	affordability	coastal considerations
radiant barrier	+	+	+	+	+				+		+	+	+	+	+	+
shingles		+	+	+	+	−		−		−	−		+			−
tiles	−				−	−	+	+	+	+	+				−	
sheet metal		+		+	−			+	+					+		+
green roof	−	−			−	−	+	+	+	+	+	+	−	−		
rubber	−				−		−		−	−	−					−

insulation

	required equipment	thermal performance	environmental impact	market exposure	affordability	coastal considerations
fiberglass batt				+	−	+
spray foam	−	+	−		−	+
rigid foam		+	−	+		

exterior finishes

	wind resistance	water resistance	lifespan	environmental impact	affordability	coastal considerations
fiber cement siding	+	+	+			+
vinyl siding	−		−	−	+	−
brick	+		+		−	

PATH Field Evalution:

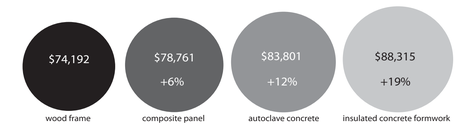
Wood, Panel, ACC & ICF

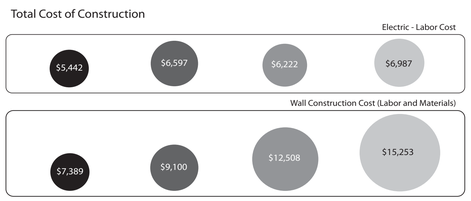
The Partnership for Advancing Technology in Housing (PATH) is made up of leaders in homebuilding, production manufacturing, insurance and financial industries, and representatives of federal agencies concerned with housing. In December of 2005 PATH published a report put together with the National Association of Home Builders (NAHB) under sponsorship of PATH's coordinating agency, the U.S. Department of Housing and Urban Development (HUD). The report, a field evaluation, constructed and tested three alternative building systems: ICFs, Composite Panels, and AACs. It can be found online at http://www.toolbase.org/pdf/FieldEvaluations/hughesfinalreport.pdf.

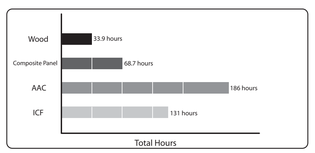
These graphs represent a small portion of data gathered for the project in 2005. "The field project evaluated three structural alternatives to wood-framed residential construction: insulating concrete forms (ICFs); an expanded polystyrene (EPS) and steel composite panel (Thermasteel); and autoclaved aerated concrete block (AAC). The materials were used to construct affordable rental duplex buildings of 2,048 square feet."

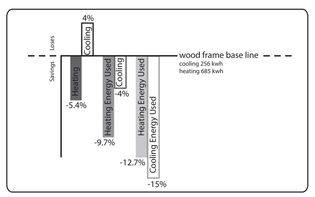
Final construction costs for the buildings, including both materials and labor, were variable: 6.2% more than the baseline wood building for the composite panel; 12% more for autoclaved concrete; and 19% more for an ICF house. However, thermal testing showed all three alternative systems performing more efficiently than the wood-framed house, with ICF's savings of 12% as the highest. Energy bill savings may recoup some initial cost.

The report acknowledges that as laborers become more familiar with these alternative systems, the time required to assemble these projects will go down, cutting down on construction costs. This field evaluation is becoming outdated, but it is one the most reputable examples we have found of housing providers measuring and comparing different construction systems built side by side.









PATH studied the heating and cooling energy needed in each home. Most homes performed better then a wood frame, making it more cost effective to keep the home comfortable. Over time this can more then make up for the primary investments to use these systems.

GCCDS

Gulf Coast Community Design Studio

Mississippi State University College of Architecture Art + Design