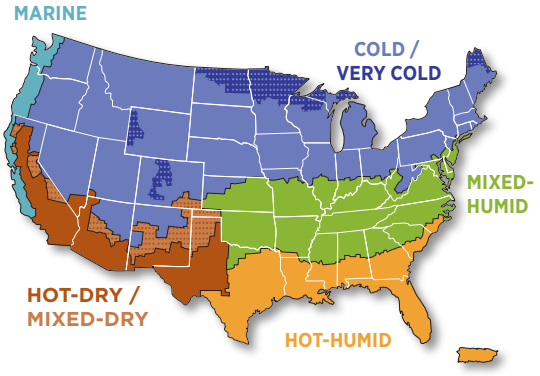
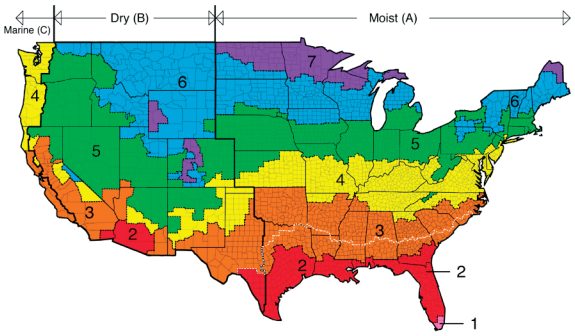
U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Building America's Optimized Solutions for New Homes

Hot-Humid Climate





IECC Climate Zones

= 1 = 2 = 3 = 4 = 5 = 6 = 7

Climate Zone Maps

Map of Building America climate regions (top) for program reporting and IECC climate zones (bottom) as a reference for compliance information

The U.S. Department of Energy's (DOE's) Building America program has been a source of innovations in residential building energy performance, durability, and affordability for over 20 years. This world-class research program partners with many of the top U.S. home builders, contractors, and manufacturers to bring cutting-edge construction and design solutions and resources to market.

The most recent goal of the Building America program is to demonstrate how cost-effective strategies can reduce home energy use by about 30%[1] in new homes, in all climate regions, by 2015. As part of the strategy to prove that this level of performance is achievable in the market, DOE created a labeling program called the DOE Zero Energy Ready Home program.

Working together, Building America and the DOE Zero Energy Ready Home programs have created this series of optimized solutions to demonstrate how builders can achieve these high savings goals, cost effectively, in each climate zone.

Building America's five major climate regions include: cold/very-cold, mixed-humid, hot-humid, hot-dry/mixed-dry and marine[2]. These climate regions are outlined in Figure 1, along with a map of the International Energy Conservation Code (IECC) climate regions as a reference for compliance information. This document outlines the Building America recommendations for achieving incremental savings in the hot-humid climate region.

Due to the tradeoff decisions that are made when building a home, there are hundreds of ways to meet Building America's savings target. The package listed in Table 1, shows just one way to cost effectively meet this goal. The far right column provides options for common building practices that can be used to obtain each particular performance objective. Unless otherwise noted, the performance values in the table are minimums. In depth descriptions, installation guidance and code compliance information for most of the options listed in Table 1 are available on the Building America Solution Center (basc.energy.gov).

Photo (top left): David Weekley

Building America SM U.S. Department of Energy

DOE's Building America Solution Center

Decades of research in energy-efficient design have led to the Building America Solution Center. Builders and contractors are encouraged to use this resource to improve the durability and performance of energy efficiency options listed in Table 1.

The Building America Solution Center provides access to expert information on hundreds of high-performance construction topics, including air sealing and insulation, HVAC components, windows, indoor air quality, and much more.

Users can navigate the Solution Center in one of four ways:

- Building components
- Labeling program checklists
- Alphabetically
- By publications

Registered users can also save customized content in their own field-kits!

Find what you are looking for on the Building America Solution Center website: ***basc.energy.gov***

Table 1. Optimized Solution: Hot-Humid Climate

Measure	Performance	Options
THERMAL ENCLOSURE		
High-R Ceiling	R-30	• Unvented Attics - Spray Foam Underside Roof - Spray Foam and Permeable Insulation - Exterior Rigid Insulation Over Sheathing - SIP Roof • Vented Attics - Blown-in Insulation or Batt Insulation
High-R Walls	R-13 Cavity and R-5 Continuous	• Single-Wall Cavity Insulation with Advanced Framing - Spray Foam - Spray Foam and Permeable Insulation - Exterior Rigid Insulation • Double-Wall Cavity Insulation • SIP Walls • Insulated Concrete Walls
Slab Foundation	Uninsulated	
High-R Window	U≤0.33 (R≥3) SHGC≤0.2	• ENERGY STAR® Certified Window • Ideally R-5 Window
Air Tightness	ACH50≤2.5	• Air Sealing • Air Barriers
HVAC SYSTEM		
Heating Equipment	80% AFUE (Gas), or 8.2 HSPF (Electric)	• Direct Vent Gas Furnace • Air-Source Heat Pump • Geothermal Heat Pump • Ductless Mini-Split Heat Pump
Cooling Equipment	18 SEER	• Air-Source Heat Pump/Air Conditioner • Geothermal Heat Pump • Ductless Mini-Split Heat Pump
Duct Location	Conditioned Space	• Raised Ceiling • Dropped Ceiling • Buried and Encapsulated Ducts
Whole-House Ventilation	ASHRAE 62.2 5 cfm/W and 30% Enthalpy Recovery	• Exhaust-Only Ventilation • Supply-Only Ventilation • Balanced Ventilation
ENERGY EFFICIENT COMPONENTS		
Water Heating	EF 0.8	• Gas Tankless • Heat Pump Water Heater • Solar
Lighting	ENERGY STAR	• Compact Florescent Lighting (CFL) • Light Emitting Diode (LED)
Appliances	ENERGY STAR	
Exhaust Fans	ENERGY STAR	• Individual Room • Central Exhaust
Ceiling Fans	ENERGY STAR	

Abbreviations: Solar Heat Gain Coefficient (SHGC), Annual Fuel Utilization Efficiency (AFUE), Heating Seasonal Performance Factor (HSPF), Air Changes Per Hour (ACH), Seasonal Energy Efficiency Ratio (SEER), and Energy Factor (EF).

The case studies in this section show real-world examples of how builders can meet (or even exceed) the savings target, even if they don't meet all of the recommendations in Table 1. Tradeoff decisions are often based on local materials, labor costs, and market preferences.

Sterling Brook Custom Homes: Double Oak, TX

Since completion of the Village Park Eco Home in Highland Village north of Dallas-Fort Worth, Texas, in April 2014, more than 1,300 people have toured the home and thousands have visited the website or viewed YouTube videos of the home's construction. Consumers and builders have learned about the house through local and regional news stories and through social media including Facebook, Pinterest, Twitter, and Instagram.

The home employs an unvented attic with a hip roof design on most of the roof elevations, a hip roof is more resistant to uplift in high winds than a gable roof. The unvented soffits keep blown rain out of the attic. Sterlingbrook goes beyond code by including hurricane strapping to tie the bottom plate to the studs, the studs to the top plates and to the rafters, and the rafters to the ridge beam. Over the rafters, the roofers installed 7/16 OSB (oriented strand board) then overlapping layers of ice and water shield over the entire roof. The standing seam metal roof consists of 24-gauge, reflective grey-colored galvalume roofing with hidden fasteners.

The home incorporates a real-time energy monitoring system. This unit monitors whole-house energy usage as well as usage on specific circuits and displays the information on one of the two iPads tied to the home. It also controls the HVAC (heating, ventilation and air-conditioning), lighting, and audio/video equipment.

See the full case study online:
http://energy.gov/sites/prod/files/2014/09/f18/DOE_ZEH_Sterling_Brook_09-20-14.pdf

M Street Homes: Houston, TX

M Street has a strategic plan to be the leader in energy efficiency in Houston. M Street knows an integral part of being a high-performance builder is helping consumers understand sustainable, high-performance construction. M Street conducts extensive training of all company personnel to help staff understand the building science behind features that appear in promotional literature by mandating structured seminars and assigning mandatory reading materials. Every model home sales office has a demonstration center where sales representatives show customers how M Street utilizes certain products to improve energy efficiency and the website provides extensive educational materials.

All of the home's space heating needs are provided by waste heat from the tri-generation system. The reason M Street calls the system a tri-generator is because it provides electric power, heating, and cooling. The liquid coolant used to cool the generator absorbs heat from the engine and carries it to the radiator coils, located in the electric furnace plenum, where the furnace blower distributes it throughout the home with a heating efficiency of 100+%. Another hot water loop circulates from the generator to a heat exchanger outside the heat pump water heater. The water heater is essentially a storage tank and is only used for water heating if needed; however, the liquid line heats all of the water used by the family.

See the full case study online:
http://energy.gov/sites/prod/files/2014/09/f18/DOE_ZEH_M_Street_09-20-14.pdf

DOE Zero Energy Ready Home

The DOE Zero Energy Ready Home label establishes a framework for continuous improvement that will help propel the market toward net-zero energy performance. In the future, a consumer will have the option to buy an affordable DOE Zero Energy Ready Home anywhere in the United States—a home that can seamlessly accept a small photovoltaic solar array to offset the energy use of the home over the course of a year.

Find technical resources and learn how to become a Zero Energy Ready Home partner on the Building Technologies Office website: *http://energy.gov/eere/buildings/zero-energy-ready-home*

Southeast Volusia Habitat for Humanity: Edgewater, FL

In August 2013, Southeast Volusia County Habitat for Humanity (Volusia Habitat) completed its first DOE Zero Energy Ready Home in Edgewater, on the Atlantic coast of central Florida. This 1,250 ft^2, 3-bedroom, 2-bath home achieved a Home Energy Rating System (HERS) score of 49. That is 70 points better than typical existing homes, which have an average HERS score of 120 or higher. And it means substantially lower utility bills for the Habitat affiliate's homeowners.

Volusia Habitat has been building progressively more energy-efficient homes over the last several years thanks to an ongoing relationship with the Florida Solar Energy Center, a DOE Building America research partner. Volusia Habitat uses a raised heel roof truss (also known as an energy truss) to provide more insulation at the attic perimeter. The team installs pieces of rigid foam as baffles in each truss bay, which help to maintain the full depth of 8 inches of insulation over the top plates while preventing the insulation from spilling into the soffit vents.

See the full case study online:
http://energy.gov/sites/prod/files/2014/07/f17/ba_zerh_case_study_volusia.pdf

Through targeted research, industry partnerships, and collaboration with related DOE residential initiatives, Building America works to make cost-effective, energy-efficient homes a reality for all Americans.

Along with energy savings, the program also focuses on solutions that lead to:

- Risk identification and mitigation
- Improved indoor air quality, which can benefit occupant health
- Higher comfort levels in all rooms throughout the home
- Durable and moisture-resistant building designs and renovation
- Increased builder profitability through reduced construction time
- Opportunities for new product designs that save energy, material, and installation costs.

1 Compared to the most recent House Simulation Protocols, roughly consistent with IECC 2009 and updated lighting, appliances and miscellaneous electric loads: *http://energy.gov/sites/prod/files/2014/03/f13/house_simulation_protocols_2014.pdf*

2 A detailed description of Building America climate regions is available at *http://energy.gov/eere/buildings/climate-zones*

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For more information, visit:
buildingamerica.gov

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The U.S. Department of Energy's Building America program is engineering the American home for energy performance, durability, quality, affordability, and comfort.