BUILDING ENERGY CODES FACTSHEET

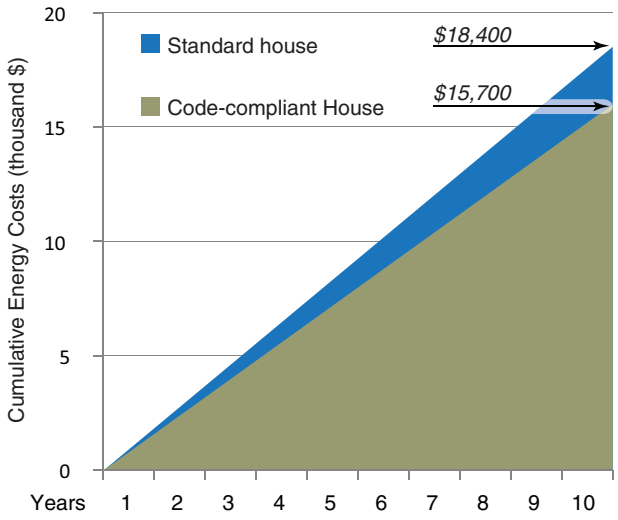
Residential Energy Codes Build a Better Bottom Line

■ Improve quality ■ Minimize call backs ■ Reduce the cost of homeownership

Why adopt energy codes?

Energy codes directly benefit Mississippi home builders by helping ensure quality installation of energy features, thus reducing customer complaints and call backs, and delivering a house with lower utility bills, improved indoor air quality, and a higher comfort level. With the adoption of the 2009 International Energy Conservation Code (IECC) as its residential building energy code, Mississippi will be investing in long-term energy savings for homeowners. Energy codes will also boost the local economy by allowing consumers to spend money that would have otherwise been spent paying utility bills on other goods and services. With energy efficiency, everybody wins.

Energy Costs: Code-compliant vs. Standard House



Over a 10-year period, a code-compliant house can save an estimated $2,700 in energy costs. Projected energy costs are calculated in accordance with the U.S. Energy Information Administration (EIA).

Peace of mind from verification and testing

One of the most important provisions in the 2009 IECC is the requirement for verification and testing of a home's energy features. Of particular importance, the energy code requires proper sealing of the building envelope and forced-air ducts in order to cut energy waste, improve comfort, minimize moisture problems, and block entry of insects and other pests. Once sealed, the forced-air duct systems located in unconditioned space undergo a duct leakage test. A home also receives either an envelope leakage test or comprehensive visual inspections to ensure all penetrations are properly sealed.

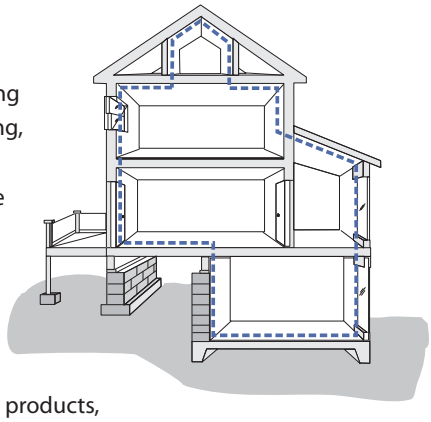
Blower door diagnostics indicate the level of "tightness" of a building. This helps determine air leakage of the building and pinpoint areas for sealing.

In Mississippi, these simple tests will help builders verify the quality of trade contractors' work, they do not add significantly to the cost of construction, nor do they disrupt the normal construction sequence. Typically, a qualified technician uses a specialized fan to measure the air tightness of both the building envelope and the duct distribution system. Together, both of these tests can typically be performed in under one hour. Once these tests are complete, homeowners can rest easy knowing that their house is properly sealed.

The house as a system

The energy code looks at the house as a system, which, to function properly, is dependent on the interaction of the following components: insulation, air sealing, windows, mechanical systems, and lighting. Each component must be designed for the Mississippi climate and installed correctly, or the entire system can suffer problems.

Insulation



The entire building envelope—the roof/ceiling, exterior walls, and floor/foundation—should have continuous insulation with no gaps, voids, or compressed areas. The code provides builders great flexibility in choosing techniques and products, but requires that materials be installed properly according to the manufacturer's specifications. Installing insulation correctly requires coordination between contractors. Improperly installed insulation can reduce performance by as much as 25%. The energy code sets minimum R-value requirements for insulation based on local climate:

- Ceilings with unconditioned attic above: R-30
- Exterior walls: R-13
- Floors over unconditioned space: R-19 (R-13 in Climate Zone 2)

Trades to engage:

- ☐ Framers to minimize unnecessary framing
- ☐ Insulation contractors to ensure continuous coverage
- ☐ All contractors who have access to the building envelope after insulation is installed to ensure all openings have been sealed

Air sealing

Building tight enclosures is a fundamental principle of energy-efficient construction because air leakage is detrimental to the performance of insulation and impacts the comfort, durability, and air quality of a home. Air sealing requires special attention to many details of the building envelope, including:

- Plumbing and electrical penetrations
- Chases for ducts and plumbing
- Rim and band joists
- Recessed light fixtures
- Attic hatches and kneewalls
- Window and door rough openings

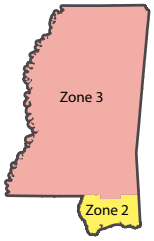
In general, it is best to air seal before installing insulation, or to use foam products that both seal and insulate. Many insulation contractors have air sealing crews that use caulk or spray-applied foam products to seal penetrations in the building envelope before insulating. The code requires either thorough visual inspections to ensure compliance with air sealing requirements, or a blower door test at final inspection. If a blower door test is conducted, homes must achieve less than 7 air changes per hour at a pressure difference of 50 pascals (7 ACH_{50}).

Trades to engage:

- ☐ Air sealing contractors

Windows

Efficient windows cut energy waste, reduce condensation, enhance occupant comfort, and may contribute to a reduction in HVAC size. The energy code requires that windows meet specific performance levels. The National Fenestration Rating Council (NFRC) rates window performance based on average whole window U-value, the measure of thermal conductance, and the Solar Heat Gain Coefficient (SHGC), a measure of the amount of solar energy transmitted through the window. The window requirements of the energy code, listed below, depend on the location of the home. In general, they are met by most double-pane, low-e windows.



	U-value	SHGC
Climate Zone 3	0.50	0.30
Climate Zone 2	0.65	0.30

Trades to engage:

- ☐ Window manufacturers to provide technical details regarding particular products
- ☐ HVAC designers to calculate impact on equipment sizing

Mechanical systems

Central heating and cooling systems use a forced-air duct system to distribute conditioned air throughout the living spaces in the house. These systems are critical to occupant health, safety, and comfort, as well as the home's overall energy performance; therefore, the code requires the following procedures:

Load calculations. Mechanical equipment must be sized based on a Manual J load calculation. Manual J is a computational load procedure designed by the Air Conditioning Contractors of America (ACCA) to help industry professionals estimate heating and cooling loads. The results of the analysis represent the foundation on which a system is sized and selected, and on which air distribution is calculated.

Equipment sizing. Mechanical equipment must be selected based on the load calculation and meet the sizing limitations outlined in ACCA Manual S.

(*Continued on page 4)*

CASE STUDY

This case study estimates savings in an energy-efficient and code-compliant home by comparing it to a standard home. This comparison accounts for differences in initial cost, mortgage payment, and energy bills. A wood-frame, single-family detached, all-electric home in Jackson, Mississippi was modeled. Energy savings for homes using natural gas or propane are comparable. Based on regional information from the U.S. Census Bureau, the typical home was assumed to be 2,000 sq.ft., two-story on a slab with three bedrooms, priced at $176,000.[1] A regional survey was conducted to determine typical construction and cost characteristics. An electricity rate of 9.97 cents per kwh was used.[2]

HOUSE SYSTEMS

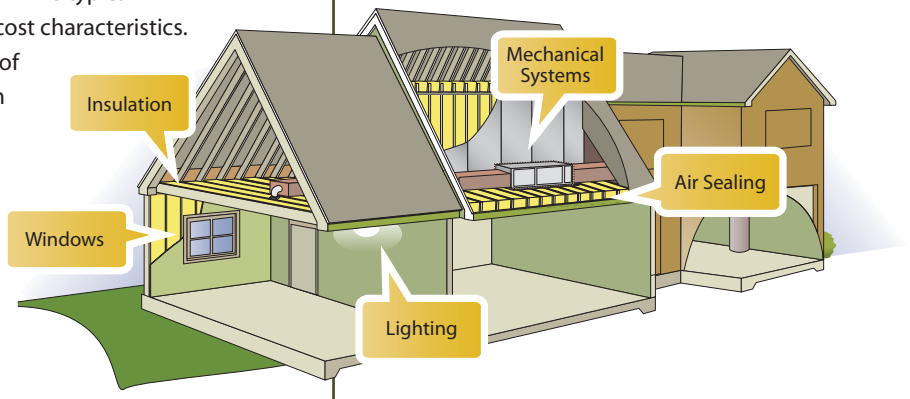
Insulation – the thermal boundary surrounding the conditioned space

Air sealing – sealing critical leakage points in the building envelope and forced-air ducts to block air leaks, moisture and pests

Windows – must meet the minimum performance specifications defined by climate zone

Mechanical systems – contractors should follow ACCA's system design process to ensure quality and performance

Lighting – at least 50% of installed lights must be high efficiency



Features	Standard House	Code Compliant House	Cost Difference
Air Sealing	Minimal (10 ACH_{50})	Extensive and tested (7 ACH_{50})	$350
Wall Insulation	R-13 [4]	R-13	$0
Ceiling Insulation	R-30 [4]	R-30	$0
Windows	Double-pane metal: U-value (0.65), SHGC (0.66)	Double-pane low-e: U-value (0.5), SHGC (0.30)	$312
Duct Sealing	Minimal (15% leakage to outside)	Extensive and tested (8% leakage to outside)	$350
Duct Insulation	R-6 (attic) [4]	R-8 (attic)	$120
Equipment	13 SEER, 8.1 HSPF, 3.5 ton [4]	13 SEER, 8.1 HSPF, 3 ton (Manual J)	-$100
Water Heater	50-gallon electric (0.92 EF) [4]	50-gallon electric (0.92 EF)	$0
Lighting	10% efficient	50% efficient	$60
Total Cost and Expenses	**Standard House**	**Code Compliant House**	**Cost Difference**
Price of Home	$176,000 [2]	$177,092	+$1,092
Annual Mortgage (5% interest)	$9,072	$9,126	+$54
Annual Energy Cost	$1,826	$1,557	-$269
Total Annual Expenses	$10,898	$10,683	-$215
			Annual Savings of $215

Mechanical systems (Continued from page 2)

Duct sealing and insulation. Duct systems must be sealed correctly with mastic or UL-181 tape so that they are efficient, maintain uniform temperatures throughout the house, operate quietly, and do not adversely impact comfort or indoor air quality. The energy code requires ducts outside the envelope to be tested for leakage. If tested at final inspection, total leakage to outside must be less than or equal to 8% of conditioned floor area, or total duct leakage must be less than or equal to 12% of conditioned floor area. If ducts are tested at rough-in, different requirements apply. Refer to page 31 of the 2009 IECC for details.

Duct systems must also be insulated properly:

- Ducts in attic: R-8
- Ducts in unconditioned space: R-6

This technician is performing a duct leakage test that ensures the integrity of the duct system.

Trades to engage:

- ☐ HVAC designer regarding the impact of air handler location, duct materials selection, and ductwork configuration on system sizing and performance
- ☐ Duct installer on using proper techniques for sealing ducts

Lighting

Choosing more efficient light bulbs or fixtures can make a difference on utility bills and for the environment. The energy code requires 50% of the bulbs in a home's permanent fixtures to be high-efficacy (e.g., compact fluorescent, linear fluorescent, or LED). Lighting efficacy is a measure of how many lumens are produced for a given wattage input, (lumens per watt).

Resources:

www.southface.org

www.energycodes.gov

www.bcap-ocean.org

www.mississippi.org

Footnotes

1. BCAP - www.bcap-ocean.org
2. U.S. Census Bureau. Characteristics of new Single Family Houses Completed. *www.census.gov*
3. Energy Information Administration. Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State. *www.eia.gov*
4. Based on a regional survey of design and construction professionals conducted by Southface in May 2011

mississippi development authority

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