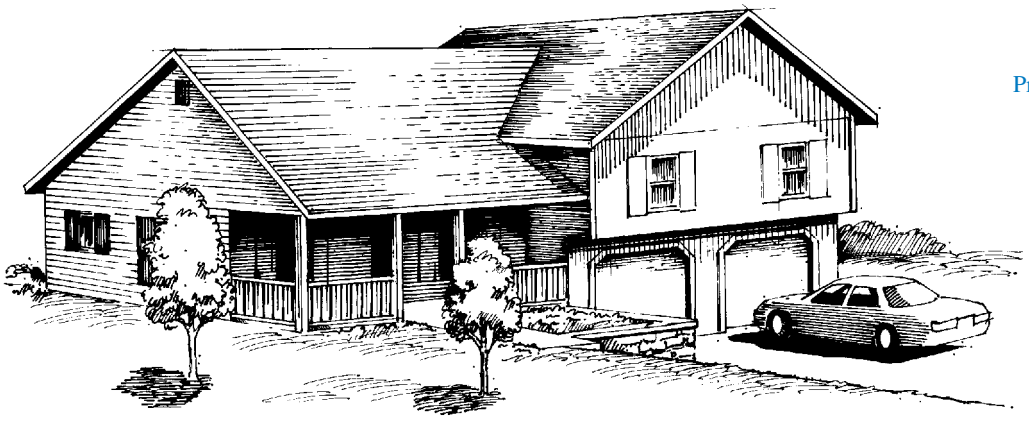
Revised 2004

Use this ***brochure*** *to answer* ***these*** *questions:*

- What are the Kansas energy efficiency requirements?
- What makes a home energy efficient?
- What is a home energy rating?
- What is the International Energy Conservation Code?
- What is an EPA Energy Star® home?
- What are recommended insulation values (R-values) for walls, floors, and attics?
- What are recommended performance ratings (U-values) for windows and doors?
- How efficient should heating and cooling equipment be?

Tips for Purchasing an Energy-Efficient Home

Including Kansas Energy Efficiency Disclosure requirements



Prepared by:
Engineering Extension
133 Ward Hall
Kansas State University
Manhattan, Kansas
66506-2508
785-532-6026
www.engext.ksu.edu

Kansas Energy Efficiency Requirements

Kansas law requires the builder or seller of a new home to provide to the buyer, upon request or prior to closing, a completed Kansas Energy Efficiency Disclosure form. The form will tell the buyer either 1) the home complies with the International Energy Conservation Code 2003 (IECC), 2) the home has received a home energy rating score of 80 or greater, or 3) the energy efficiency level for many of the home's components. To gain the most from this form, it is important the homebuyer receive it early in the home-buying process and have an understanding of the recommended energy performance level for each component of a house. This brochure provides these recommendations and explains more about achieving real energy efficiency in new-home construction.

The Kansas Legislature adopted new energy standards in 2003.

Home Energy Ratings (HERs)

A home energy rating provides an objective third-party evaluation of the energy performance of the home. A rating includes an evaluation of insulation levels and installation effectiveness, equipment sizing and performance, window properties and orientation, and measured air-tightness of the home and duct system. Each home is scored from 1 to 100 with a rating of 80 deemed to be in compliance with the IECC. Annual energy costs are also estimated. Ratings and estimated energy costs allow home buyers to compare homes they are considering for purchase, as well as evaluate savings from suggested energy improvements. Home energy raters undergo extensive training and certification to assure consistent and accurate ratings.

To get the most value from a home energy rating, the rater should be brought into the home-building process early to help evaluate options and insure a cost-effective, comfortable, and energy-efficient home. A list of home energy raters can be obtained by contacting Engineering Extension at 1-800-KSU-8898 or going to *www.ratingsalliance.org/raters.htm*.

International Energy Conservation Code

The International Energy Conservation Code 2003 establishes minimum levels of energy features for new residential construction. The IECC was adopted by Kansas statute effective July 2003 and allows several methods of compliance. The simplest method prescribes minimum R-values for walls, ceilings, and floors; maximum U-values for windows and doors; and minimum performance for heating and cooling equipment. Another compliance option allows trade-offs where higher performance by one component will offset lower performance by another. For example, higher performance windows would allow lower levels of wall insulation. All homes must also meet "basic" requirements like air sealing, duct construction and insulation, and vapor barriers.

Recommendations of the IECC should be viewed as minimum, not optimum, recommendations. In many cases, higher performance levels are cost-effective.

Recommendations

New-home component recommendations for R-values for walls, ceilings, and floors; U-values for windows and doors; and performance ratings for heating and cooling equipment are given on the following pages.

Insulation and equipment packages work together as a system. Failure to install some components, such as basement or crawlspace insulation, will adversely impact the comfort and performance of the home. Comfort and performance are also dependent on proper air sealing. Having a blower door air leakage test performed will help identify air leakage points in the home and guide the contractor to provide proper air sealing.

"Minimum" recommendations correspond to prescriptive recommendations from the IECC. The "Better" column values provide additional savings and are usually cost-effective, especially in times of rising energy costs.

"Better" recommendations provide a 30 percent savings over code-compliant construction and generally correspond to Energy Star® performance levels.

"Superior" performance can be achieved at the "Better" equipment and insulation levels if the home design and layout take advantage of natural processes to help heat and cool the home, the builder achieves low infiltration and insists on correct insulation installation, and the HVAC contractor provides air-tight duct systems and properly selects and installs equipment.

The three climate zones in Kansas are shown on the following page.

Energy Efficient Choices

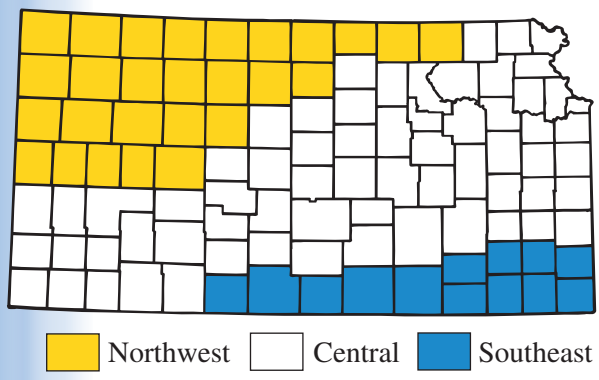
R- and U-values

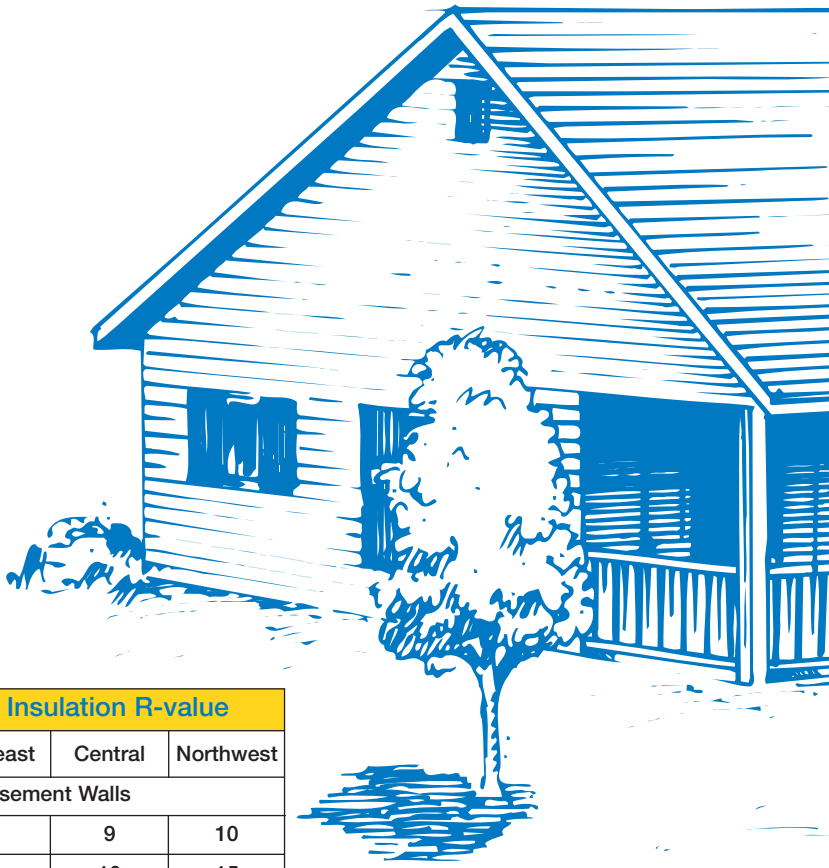
R-values listed below apply only to insulation products. The R-value is a measure of resistance to heat flow through materials. The higher the R-value, the greater the insulating value.

The U-value is a measure of heat conductance. It is used to rate doors and windows. The lower the U-value, the greater the insulation value.

Wall Insulation R-value			
	Southeast	Central	Northwest
Minimum	13	13	15
Better	16	18	20

- **Air seal all construction joints.**
- **If window area exceeds 18 percent of wall area, better windows or higher levels of wall insulation should be used.**





Foundation Insulation R-value			
	Southeast	Central	Northwest
Basement Walls			
Minimum	8	9	10
Better	10	10	15
Crawlspace Walls			
Minimum	10	10	10
Better	15	15	15
Slab-on-Grade			
Minimum	6	6	6
Better	8	8	8

- **Foundation insulation is cost-effective and represents the largest untapped opportunity for energy savings for otherwise energy-efficient homes.**
- **Foundation insulation improves comfort.**

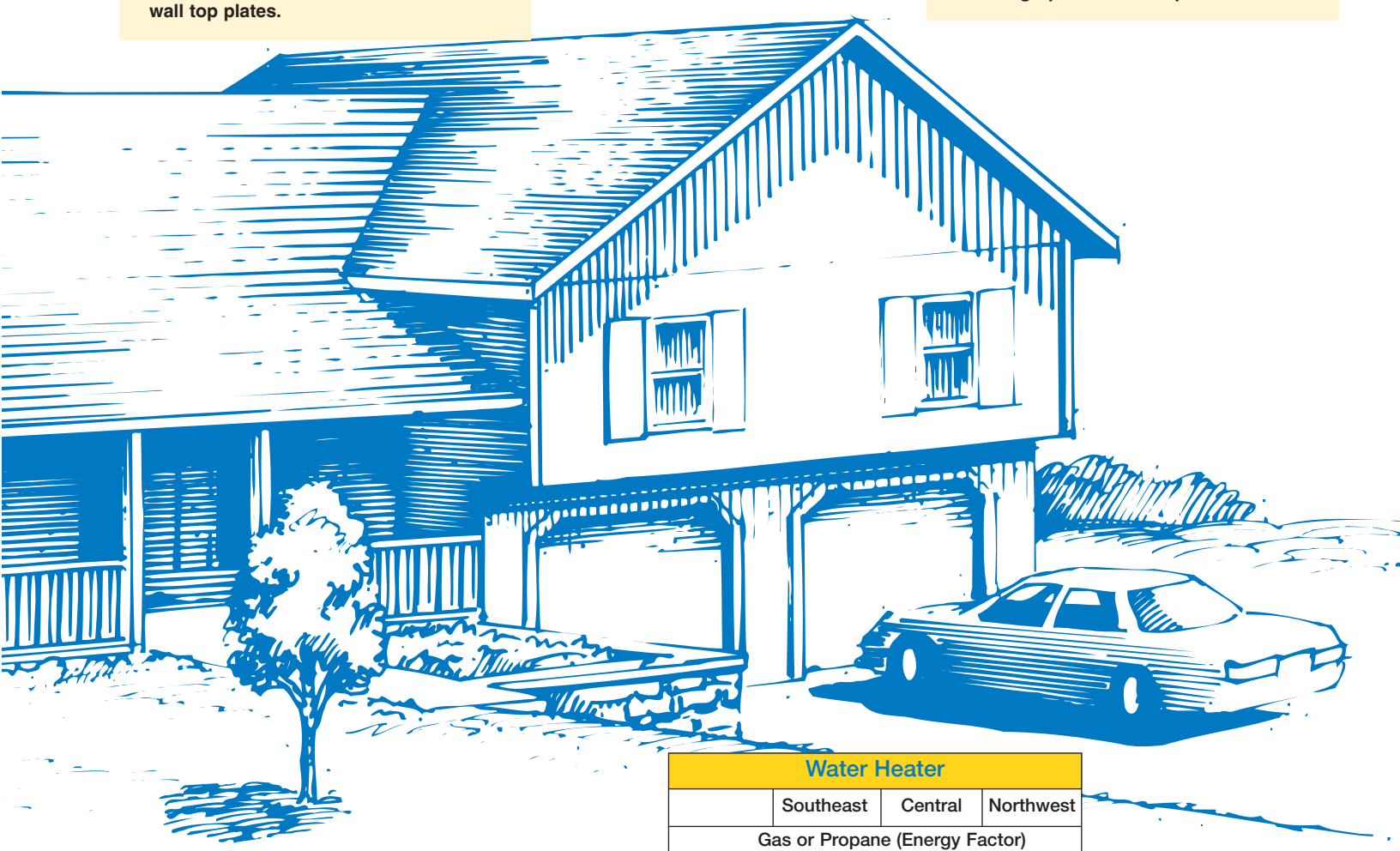
L e a d t o B e t t e r

Attic Insulation R-value			
	Southeast	Central	Northwest
Minimum	38	38	42
Better	40	42	48

- Seal all wiring, plumbing, and other penetrations into the attic.
- Insulation in cathedral ceilings should also meet these standards.
- Use raised-heal trusses to achieve recommended R-values above exterior wall top plates.

Window U-value			
	Southeast	Central	Northwest
Minimum	.45	.40	.35
Better	.35	.34	.33

- The lower the U-value, the better.
- Standard double-pane windows have a U-value of about .55.
- High-performance windows use low-e coatings, argon gas between the glass, and high-performance spacers.



Water Heater			
	Southeast	Central	Northwest
Gas or Propane (Energy Factor)			
Minimum	.55	.55	.55
Better	.60	.60	.60
Electric (Energy Factor)			
Minimum	.88	.88	.88
Better	.92	.92	.92

- Water heating is the third largest energy use in the home.
- Energy factor rates overall water heater efficiency including jacket and off-cycle losses.

Floors Over Unheated Spaces R-value			
	Southeast	Central	Northwest
Minimum	19	19	19
Better	30	30	30

- Floors over outside air should be insulated to the same level as ceilings.

Performance

Heating and Cooling Equipment			
	Southeast	Central	Northwest
Warm-Air Furnace (AFUE)			
Minimum	.78	.78	.78
Better	.93	.93	.93
Air Conditioner or Heat Pump in the Cooling Mode (SEER)			
Minimum	10	10	10
Better	14	14	12
Air-Source Heat Pump (HSPF)			
Minimum	6.8	6.8	6.8
Better	8.5	8.5	8.5
Ground-Loop Heat Pump – Cooling (EER)			
Minimum	13	13	13
Better	18	18	18
Ground-Loop Heat Pump – Heating (COP)			
Minimum	3.1	3.1	3.1
Better	3.9	3.9	3.9
Ground-Water Heat Pump – Cooling (EER)			
Minimum	16.2	16.2	16.2
Better	22	22	22
Ground-Water Heat Pump – Heating (COP)			
Minimum	3.6	3.6	3.6
Better	4.4	4.4	4.4

- **"Minimum" performance ratings are set by federal law in most cases.**
- **"Better" performance ratings are usually cost-effective, especially where energy costs are high.**

Equipment Performance Ratings

- *Annual Fuel Utilization Efficiency, AFUE* – used to rate gas or propane warm-air furnaces and small boilers.
- *Seasonal Energy Efficiency Ratio, SEER* – performance indicator for residential air conditioners and air-source heat pumps.
- *Heating Seasonal Performance Factor, HSPF* – measures heating performance of air-source heat pumps.
- *Energy Efficiency Ratio, EER* – used to rate window air conditioners and ground-loop or ground-water heat pumps in the cooling mode.
- *Coefficient of Performance, COP* – used to rate ground-loop or ground-water heat pumps in the heating mode.

For each performance rating, the higher the number, the more efficient the equipment.

Achieving Real Energy Efficiency

Energy-efficient homes save money and are more comfortable. Air sealing eliminates drafts, proper equipment sizing helps control humidity and temperature swings, and proper insulation levels will keep you warm in the winter and cool in the summer.

Simply specifying high levels of insulation and equipment efficiencies will not guarantee an energy-efficient or comfortable home. To achieve high performance, the home must be built to reduce infiltration and drafts, the insulation must be installed properly so it can achieve its rated R-value, and the mechanical system and ductwork must be properly sized and installed. Proper orientation and effective shading of windows will also improve comfort and performance by taking advantage of natural heating and cooling processes. Finally, energy-efficient lighting and appliances should be selected for maximum comfort and performance.

The following is a sample of items requiring special attention during the design and construction process.

- Air seal the house so the building has a measured air leakage rate not greater than .35 air changes per hour.
- Form a continuous thermal boundary by installing insulation in all locations including basements, crawlspaces, and slabs, not just walls and ceilings.
- Install loose-fill insulation at proper densities.
- Install batt insulation without compression, and assure it fills wall and floor cavities with no voids.
- Properly size, insulate, and seal supply and return ductwork.
- Correctly size and select heating and cooling equipment.
- Keep window area to no more than 18% of gross wall area and if site conditions permit, orient at least half of them within 20 degrees of south.

A home energy rater can evaluate and help assure these critical hidden features of the home are properly selected and installed.

Energy Star® Homes

Energy Star® homes are designed to use 30 percent less energy than those built to the minimum standards of the IECC. Higher levels of insulation, better windows, more efficient heating and cooling equipment, and comprehensive air and duct sealing all contribute to the higher performance. To be labeled as Energy Star®, homes must undergo a third-party evaluation of their energy efficiency, including a blower door evaluation of the envelope and ducts, and receive a HERs rating of 86 or better.

Heating and Cooling Equipment Efficiencies

Most heating and cooling equipment has federally mandated minimum efficiencies. This keeps very low performance equipment off the market. However, it is usually cost-effective to purchase equipment with efficiencies that exceed minimums. Furnaces and boilers with AFUE ratings in the mid-90s should be used. Minimum SEER values for air conditioners will increase from 10 to 12 in 2006. SEERs of 12 are always cost-effective in Kansas, and SEERs of 14 should be evaluated. For a comparison of heating and cooling costs for various equipment efficiencies, see Comparing Fuel Costs of Heating and Cooling Systems available on-line at *www.engext.ksu.edu/ees/henergy/publications.html* or call 1-800-KSU-8898.

Siting and Orientation

Orientation and siting of a home will have an impact on energy use. The long axis of the home should be oriented within 20 degrees of an east-west line. A majority of the windows should be placed on the southern exposure for maximum winter benefit. Overhangs are effective in shading southern windows in the summer. Window areas on the east, and especially the west, should be minimized to limit summer cooling loads and energy use. Overhangs are not effective for shading these windows. Plant deciduous trees and other vegetation to shade east and west windows. Plan your tree planting to provide maximum shading in July and August.

Air and Duct Sealing

Air infiltration and loss of conditioned air from leaking ducts represent significant heating and cooling penalties. Air and duct sealing is easiest during construction and adds little to overall cost of the home. Common locations that require sealing include the following:

- between wall assemblies and ceiling, floors, and window and door frames
- between sill plates and door frames
- at openings for utility, plumbing, and electrical presentations, especially in the attic, basement, and crawlspace

If you don't test, it's just a guess.

The IECC requires air sealing to limit infiltration but does not specify how tight a home should be. In older homes, the entire volume of air may be exchanged with the outside once or twice an hour. This is an air exchange rate of one or two air changes per hour (ACH). In new construction, an air exchange rate of .57 ACH is generally considered code compliant. Energy-efficient homes will have an air exchange rate of between .20 and .35 ACH. Homes with air exchange rates below .35 may require a separate controlled ventilation system to maintain indoor air quality.

Actual air tightness can be measured with a blower door, which uses a calibrated fan to measure tightness of the whole home. Blower door tests are always done as part of determining a home energy rating.

Ducts should be sealed with mastic or pressure-sensitive tape. Conventional duct tape will not last more than a few months and should not be used. Return-air duct systems are often constructed using wall and floor cavities as part of the duct system. Special sealing and blocking is required to seal these systems.

A duct blaster is a device for testing the air-tightness of duct systems. It pressurizes the duct system and measures leakage. Well-sealed ducts should leak no more than five percent of the rated air flow.

Windows Performance

Double-glazed windows are common in new construction and are far superior to single-pane windows. However, adding low-e coatings and argon gas between the panes significantly increases performance and adds only a small cost premium over conventional windows. The National Fenestration Rating Council (NFRC) provides a standard method of rating window performance. Insist on NFRC-rated windows.

NFRC

National Fenestration Rating Council

CERTIFIED

World's Best Window Co.

Millennium 2000+ Casement

Vinyl-Clad Wood Frame
Double Glaze • Argon Fill • Low E

ENERGY Performance

- Energy savings will depend on your specific climate, house and lifestyle
- For more information, call [manufacturer's phone number] or visit NFRC's web site at www.nfrc.org

Technical Information

	U-Factor	Solar Heat Gain Coefficient	Visible Transmittance	Air Leakage
Res	.32	.45	.58	.3
Non-Res	.31	.45	.60	.3

Manufacturing stipulates that these ratings conform to applicable NFRC procedures for determining whole product energy performance. NFRC ratings are determined for a fixed set of environmental conditions and specific product sizes.

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K-STATE
Kansas State University

For Further Information

National Fenestration Rating Council (NFRC)
www.nfrc.org/
Their on-line NFRC Products Directory provides performance information on most windows sold in the U.S.

Gas Appliance Manufacturers Association (GAMA)
www.gamanet.org/consumer/certification/certdir.htm
Their Consumer's Directory of Certified Efficiency Ratings for Heating and Water Heating Equipment provides performance ratings for most furnaces, boilers, and water heaters sold in the U.S.

Air-Conditioning and Refrigeration Institute (ARI)
www.ari.org/
Their on-line directories of certified equipment provide performance ratings for most air conditioners and heat pumps sold in the U.S.

Appliance Efficiency Guide
www.energystar.gov/index.cfm?fuseaction=find_a_product
The Energy Star Product Guide will help you find more efficient appliances and lighting products in 35 categories.

Energy Extension Service
Kansas State University
www.engext.ksu.edu/ees/henergy/publications.html
Phone: 785-532-6026 Fax: 785-532-6952

Home Energy

- Cut Winter Costs
- Home Energy—Answers to Home Energy Questions
- Energy-Efficient Appliances

Building Thermal Envelope

- Air Sealing
- Builder's Guide to Residential Foundation Insulation
- Energy-Efficient Windows
- Residential Foundation Insulation
- Residential Insulation

Space Heating and Cooling

- Comparing Fuel Costs of Heating and Cooling Systems
- Selecting a Home Cooling System
- Selecting a Home Heating System
- Solid-Fuel Heating Appliances

As required by KSA 66-1228

KANSAS ENERGY EFFICIENCY DISCLOSURE

Kansas law requires the person building or selling a previously unoccupied new residential structure to disclose to the buyer or a prospective buyer, upon request or prior to closing, information regarding the thermal efficiency of the structure (single or multifamily units, three floors and under).

Common Address or Legal Description: _____

_____

_____

This residence (select one of the following options):

_____ 1. Has been built to meet the energy-efficiency standards of the International Energy Conservation Code 2003 (IECC 2003),

_____ 2. Has received a Home Energy Rating score of 80 or greater when performed in accordance with the Mortgage Industry National Home Energy Rating System Accreditation Standard (June 15, 2002) by a rater certified and listed by Residential Energy Services Network (RESNET), or

_____ 3. Has been built to include the following energy-efficiency elements:

(1) Insulation values (R-value of insulation installed) for each of the following:

Ceiling with attic above	(R-value)_____	Cathedral ceiling	(R-value) _____
Opaque walls	(R-value)_____	Floors over unheated spaces	(R-value) _____
Floors over outside air	(R-value)_____		

Foundation type: Slab-on-grade _____

Crawlspace _____

Basement (R-value, if applicable) _____

Percent of basement walls underground _____

(2) Thermal properties of windows and doors for each of the following:

Entry door(s)	(U-value or R-value)	_____
Sliding door(s)	(U-value)	_____
Other exterior doors	(R-value)	_____
Garage-to-house door	(R-value)	_____
Windows (determined from NFRC rating or default table)	(U-value)	_____ _____ _____

(3) HVAC equipment efficiency levels:

Heating systems:	Gas-fired, forced-air furnace	(AFUE rating)	_____
	Electric heat pump	(HSPF rating)	_____
Air-conditioning systems:	Electric unit	(SEER rating	_____
	Electric heat pump	(EER rating)	_____
	Ground-source heat pump	(EER rating)	_____
Duct insulation levels:	Insulation _____ (R-value of ducts outside building envelope)		
Thermostat:	Manual control type	_____	
	Automatic setback type	_____	

(4) Water heating efficiency levels:

Water heater fuel type	_____
Water heater capacity	_____
NAECA energy factor	_____

Additional information: (Attach additional sheet if necessary.)

_____

_____

_____

Seller signature: _____ Date: _____

Seller name/address: _____

Buyer signature: _____ Date: _____

Buyer signature: _____ Date: _____

This form may be reproduced. Form available from Kansas Corporation Commission, Energy Programs, 1500 SW Arrowhead Road, Topeka, KS 66604; Phone: 785-271-3170; Fax: 785-271-3268; or for downloading at *www.kcc.state.ks.us/energy/energyform.pdf* (Rev. 6-03)