Home Energy

Answers to Home Energy Questions

October 2002

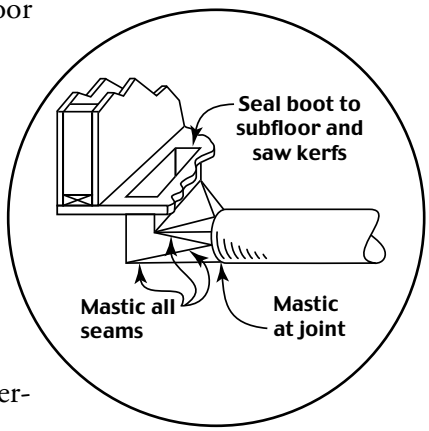
Introduction

Home energy costs represent the third largest cost for housing, behind mortgage and taxes. In typical Kansas climates, the average family spends more than $1,400 annually for energy to heat, cool, and operate appliances in its home. Decisions we make about which appliances to purchase, what features we want in our housing, and how we operate those homes and appliances have a great impact on our energy costs.

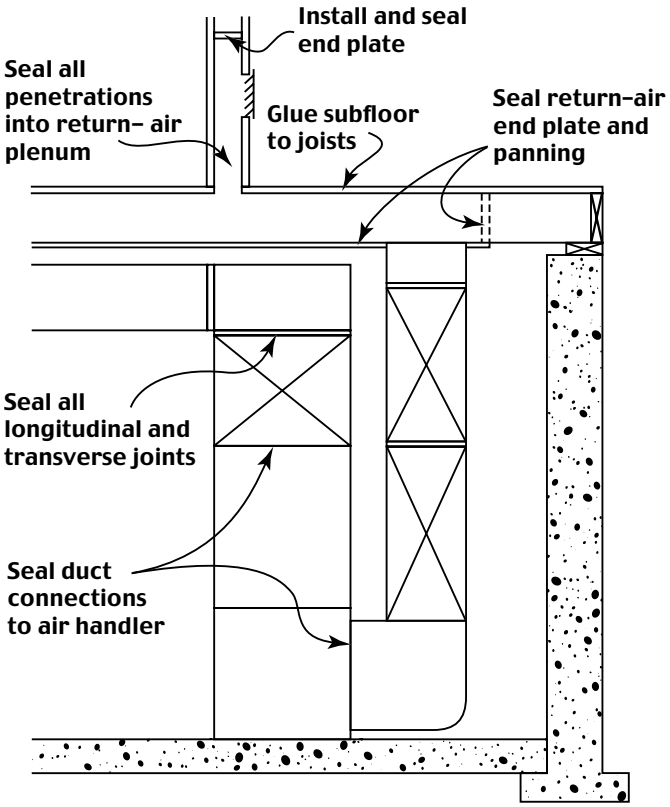
This guide provides answers to commonly asked questions regarding home energy and indoor air quality. After each section, a list of additional resources you can explore for more detailed treatment of the issues or to find answers to related questions is provided. You can also receive personal assistance with your questions by contacting Kansas State University Energy Extension at 785-532-6026 or by email at engineeringext@K-State.edu. Specialists can answer your questions on how to significantly reduce the amount you spend on energy and improve the indoor environment.

1. How should ductwork be sealed for energy efficiency?

Studies indicate leaky ductwork can increase the cost of heating and cooling 20–30 percent. The best opportunity for sealing ducts is during initial construction. Supply ducts leak at connections to the furnace, joints between duct sections, and the connection to the register fitting. Return-duct systems are frequently constructed by routing return air through wall and floor cavities. Leaks in these building components are very common.



Duct tape is not a permanent seal for either supply or return ducts. Joints in metal or rigid fiber-



glass supply ducts can be sealed with special duct-sealing mastics. Duct mastic is a thick paste that is applied, sometimes in combination with a mesh tape, to form a permanent seal. Metal foil tape designed for sealing ducts is also effective. Duct surfaces need to be cleaned before the tape is applied.

Return-air systems using metal or rigid fiberglass ducts can be sealed like supply ducts. However, if wall and floor cavities are used, all openings into the cavity for wiring or plumbing need to be sealed. Foam sealants work best. If a wall cavity is used for a vertical return-air path, the sheetrock should be sealed to the entire perimeter of the cavity. When using panned floor joists for horizontal air paths, seal the cavity with caulk or foam, and then seal the panning in place. A sealed end cap is also needed.

If either supply or return systems use flexible plastic ducts, the duct should be pulled tight to eliminate sags and mechanically fastened to the fitting to assure permanent attachment.

Accessible ducts in existing housing can be sealed with mastic or metal tape. Hidden ducts are difficult to seal. One method, using an aerosol duct sealant, has good results on existing ducts.

See also:
www.energyoutlet.com/res/ducts/index.html
www.homeenergy.org/consumerinfo/
www.energycodes.gov/training/consumer_ed/
www-epb.lbl.gov/aerosol/

2. How and where should ductwork be insulated?

Ducts located outside or in unconditioned spaces should be insulated. The International Energy Conservation Code recommends R-8 on ducts outside the house and R-5 on ducts located in unconditioned spaces. Attics and vented crawl spaces are considered outside spaces. Garages and unvented crawl spaces are unconditioned.

Vinyl-backed fiberglass insulation used in metal buildings is often used on ducts. It is available from insulation wholesalers in wide widths and can be cut to fit.

Commercially manufactured duct insulation has a very strong foil-scrim-kraft (FSK) facing. It's more expensive than other options for insulating ducts and comes in 48-inch widths.

If return-air paths are constructed above a garage or crawl space, use insulated duct board of the thickness needed to achieve the recommended R-value, rather than metal panning. Use duct board that has a finished surface on both sides to minimize dirt and mold concerns, and seal with foam.

See also:
www.buildinggreen.com/products/ductboard.html
www.nrel.gov/docs/legosti/fy98/23223.pdf

3. What are recommended summer and winter thermostat settings and setback guidelines?

Temperature settings are a matter of individual preference. Research indicates most people are comfortable at winter inside temperatures of between 68 and 75°F, and between 73 and 80°F in the summer. Clothing, gender, humidity, age, and activity level affect the temperature at which you are comfortable. Lower winter and higher summer temperature settings will reduce home energy use.

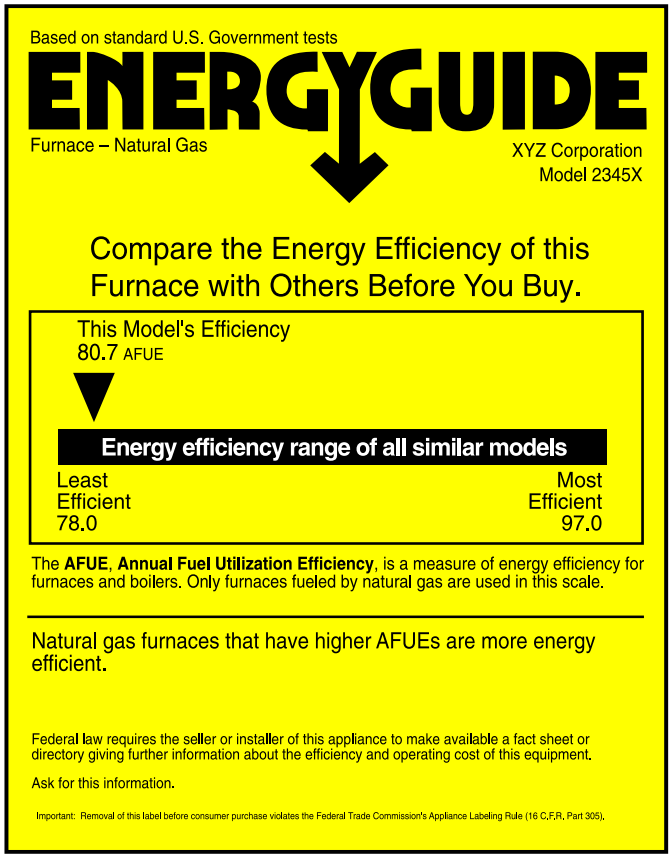
Turning your thermostat down at night and when you are gone for several hours will save energy and money. The EPA Energy Star™ program estimates consumers can save 20–30 percent of their heating and cooling costs if they use a programmable thermostat to automatically lower the thermostat setting in the winter and raise it in the summer when the house is not occupied. There is no "right setback temperature," but most units can be set at 62°F while you are away and at night during the winter, and at 82°F while you are away during the summer.

See also:
www.energystar.gov/products

4. What are recommended energy ratings for furnaces, air conditioners, and heat pumps?

The National Appliance Energy Conservation Act (NAECA) sets minimum performance standards for residential heating and cooling equipment. Central air conditioners and heat pumps have a seasonal energy efficiency ratio (SEER) rating. Heat pumps are rated in the heating mode with a heating seasonal performance standard (HSPF). Furnaces have an annual fuel efficiency standard (AFUE) rating. Current federal minimum performance standards are SEER – 10, HSPF – 6.8, and AFUE – 78. While these represent the minimum performance levels you can purchase, it is often cost-effective to purchase more efficient equipment.

SEER 12 air conditioners and heat pumps are usually cost-effective in Kansas. In areas with high electricity costs, higher ratings are justified. Units are available with SEER ratings of up to 17. An HSPF of 7.6 is recommended for heat pumps in most areas of Kansas, and higher ratings are warranted in high-electricity-cost areas.



Conventional furnaces have AFUEs of between 78 and 82. High-efficiency furnaces usually start with an AFUE of about 92 and go as high as 96. The cost premium for 90 + percent high-efficiency furnaces can usually be justified, especially where gas prices are high or the heating fuel is propane. Two-stage heating and cooling equipment is rapidly coming onto the market. These appliances offer higher levels of comfort and reduced noise. Any improvements in energy performance are reflected in the SEER or AFUE ratings.

See also:
www.aceee.org/consumerguide/
www.eren.doe.gov/femp/procurement/

5. Where and when should heat pumps be used?

Heat pumps can be used throughout Kansas. They should be considered as an option to combustion heating systems, especially where propane is the only fuel available or where the electric utility offers lower rates when a heat pump is used. One factor in making a decision to purchase a heat pump is the cost of operation in comparison to propane or natural gas. You can estimate the cost of heating an average 1,500-square-foot Kansas home with a heat pump or a warm-air furnace by following the example below. Actual heating costs will vary based on the size and condition of the home, local climate, and the occupants. Substitute your fuel costs and equipment performance into these equations to estimate your costs. Be sure to check on whether or not the utility provides a lower rate for electricity if a heat pump is installed. Heat pumps in the cooling mode are just as efficient as comparable air conditioners.

See also:
www.energystar.gov/products/

Estimating Kansas Heating Costs

Heat Pump –

HP operating costs = Cost of electricity x 70,000 / HSPF
Electricity cost = $.06/kWh
HSPF = 7.6
HP operating costs = .06 x 70,000 / 7.6 = $553

Furnace –

Natural gas furnace operating costs = Cost of natural gas x 7,000/AFUE
Cost of natural gas = $5.50/MCF
AFUE = 92
Natural gas furnace operating costs = 5.50 x 7,000 / 92 = $418

Propane furnace operating costs = Cost of propane x 110,000/AFUE
Cost of propane $.75/Gal
AFUE = 92
Propane furnace operating costs = .75 x 110,000 / 92 = $896

6. Are ground-source heat pumps economical in Kansas?

Yes, ground-source heat pumps can be cost-effective. The initial cost is higher, but they can have lower operating costs than conventional (air-source) heat pumps and warm-air furnaces.

There are two types of ground-source heat, groundwater and ground-loop heat pumps. Groundwater heat pumps draw water from a well, circulate it through the heat pump, and discharge the water back into the ground. The water entering the equipment is at nearly constant temperature.

Ground-loop heat pumps circulate a glycol and water mixture in tubes buried in the ground. The glycol/water mixture slowly gets colder in the winter, sometimes getting below freezing. In the summer, it warms up. As a result, the annual performance of a ground-loop system is generally lower than a groundwater system.

Because much of the added cost of a ground-source heat pump is in the supply and discharge wells or the ground loop, it is critical to build an energy-efficient house. This will reduce the required capacity of the heat pump, and minimize the size and cost of the wells or loops. Because oversizing is costly, it is critical to develop an accurate estimate of annual heating and cooling loads.

A builders' guide titled *Ground-Source Heat Pumps – An Efficient Choice for Residential and Commercial Use* is available by contacting Engineering Extension at 785-532-6026.

See also:
www.geoexchange.org/home.htm
www.igshpa.okstate.edu/visitor.htm

7. How critical is proper sizing of air conditioners to meet cooling requirements?

Summer comfort is affected by both temperature and humidity in a home. Air conditioners both cool and dehumidify the air, but only when they run. Moisture is generated in a home from plants, people, showers, cooking, and from outside air leaking into the home. Many of these processes occur day in and day out, regardless of the weather. Because an air conditioner runs more hours when it is hot outside, it provides maximum dehumidification then. During mild weather, it runs fewer hours and removes less moisture. These higher humidity levels during mild weather reduce comfort.

Oversizing an air conditioner reduces the number of hours it runs during both very hot weather and especially during mild weather. This increases problems with humidity control and comfort.

Air conditioners should be sized according to the *Air Conditioner Contractors of America Manual J* or similar methods. Using a rule of thumb for sizing often results in oversized equipment that costs more to purchase initially, increases operating costs, and provides lower levels of comfort. Ask your contractor what method he or she uses when sizing air conditioners.

8. What are critical items of maintenance on furnaces and air conditioners?

Most annual maintenance tasks are best left to qualified service technicians. Have a professional check your unit annually. However, there are some routine service items you can perform. Always shut off the power to the unit before you perform any maintenance.

Replace the filter as needed. Some filters need changing monthly, while others get dirty every three months. Keep an extra one on hand so when you check, you can replace as needed. Write the filter size on the exterior of the furnace cabinet so you know what size is needed without opening the unit.

Keep all combustible materials away from water heaters or furnaces, and the flue pipes coming from these appliances. This includes clothes, papers, dust, and pet hair.

Inspect and carefully clean the outside of the condensing unit. This is the part of your air conditioner that sits outside. First shut off the power. Use a soft bristle brush and remove dust, leaves, and other debris from the unit. The fins are often made with aluminum, so be careful not to damage them or force dirt deeper into the coils.

See also:
www.cee1.org/resid/rs-ac/hvac.php3

9. What kind of windows are recommended for Kansas climate?

High-performance, double-pane windows are cost-effective in new home construction and should be used when windows are installed or replaced. The National Fenestration Rating Council rates a majority of windows sold. Its rating includes four key window performance indices: U-factor, solar heat-gain coefficient (SHGC), visible light transmittance (VLT), and air leakage.

The lower the U-factor, the less heat is transmitted through the window. Low U-factor windows use special low-emissivity (low-e) coatings to reduce heat loss; the space between the panes is filled with argon or krypton gas; and they employ thermally improved spacers to hold the panes apart. Windows with U-factors below .40 are readily available. Because many of these features are integrated in the production of windows, the cost premium for high-performance windows is not high, usually around 5 percent over conventional double-pane windows.

Solar heat-gain coefficient is a measure of the heat entering through the window as solar radiation. Because Kansas is considered both a heating and cooling climate, it is recommended to use windows with a low SHGC on the east and west to reduce summer cooling requirements, and windows with a higher SHGC for south windows to maximize passive winter heating.

Visible light transmission is a measure of the light allowed through the window.

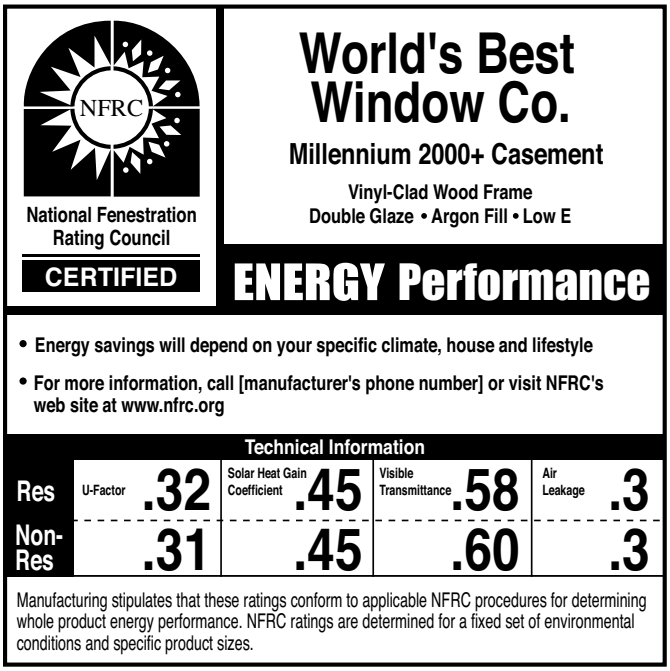
Air leakage is a new rating factor that rates each window assembly type according to air-leakage characteristics. Lower is better. This rating is optional and not all manufacturers provide it.

Energy performance is only one feature when selecting new windows. You will want to purchase windows that have low maintenance. This might include vinyl windows, or vinyl or metal-clad wood windows.

See also:
www.energystar.gov/products/
www.nfrc.org

10. How can I compare windows?

The National Fenestration Rating Council provides ratings for most windows sold. The ratings are available online. Windows with NFRC labels are labeled with the four key performance indices. EPA's Energy Star™ program also provides information on comparing and purchasing climate-responsive, energy-efficient windows.

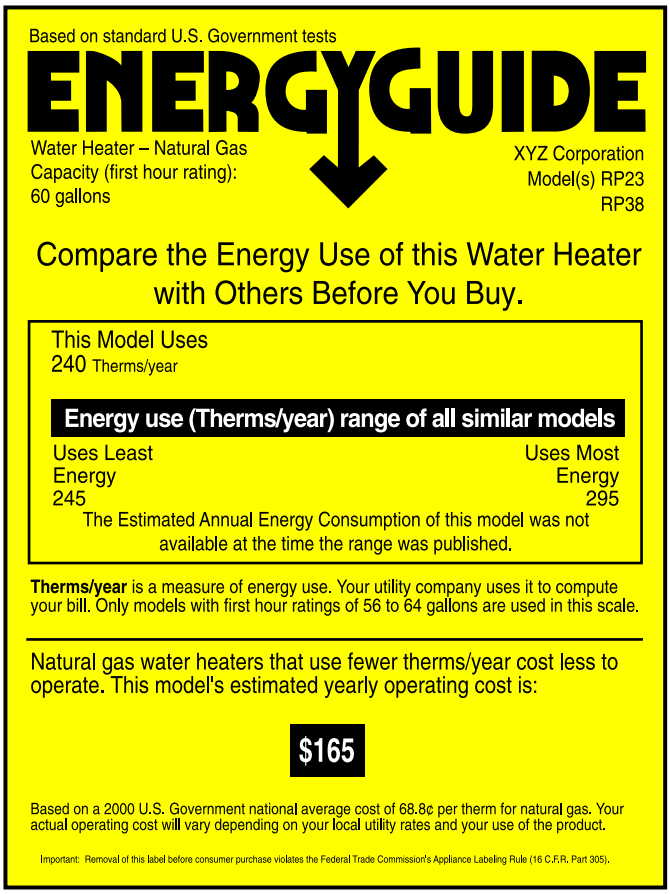


See also:
www.energystar.gov/products
www.nfrc.org
www.drpane.com/
www.engext.ksu.edu/ees/henergy/publications.html

11. How are new water heaters rated for energy efficiency?

Water heaters have an energy factor (EF) that rates the heater's overall energy performance. Natural gas and propane heaters have energy factors of between .5 and .7, while electric heaters have EFs of between .75 and .95. Even though electric heaters have a higher rating, the cost per Btu is higher for electricity, so gas or propane water heaters may be less expensive to operate.

The EnergyGuide label provides an estimate of annual operating costs for the water heater. It enables you to compare different models and different energy sources. The energy guide also lists the first-hour rating.



The first-hour rating measures the capacity of the water heater and is a better gauge of the quantity of hot water provided than the physical size in gallons. For example, a 40-gallon gas water heater may produce as much hot water as a 65-gallon electric model. Use the following to estimate the first-hour rating needs of your home.

Your house has			
How many bathrooms	1 to 1-1/2	2 to 2-1/2	3 to 3-1/2
How many bedrooms	1 - 2 - 3	2 - 3 - 4 - 5	3 - 4 - 5
First-hour rating of :	43 - 60 - 60	60-70-72-90	72 - 82 - 90

See also:
www.consumerenergycenter.org/homeandwork/homes/inside/index.html

12. What are the options for home water heating?

Most homes use conventional electric or combustion water heaters. Plumbers, consumers, and building officials are familiar and comfortable with these options. However, there are others.

On-demand water heaters only heat water when there is a demand for it. There is no storage tank holding a supply of hot water. On-demand water heaters can be small, serving a single outlet, or larger, serving multiple uses. Small, point-of-use demand water heaters are typically installed under a bathroom lavatory or kitchen sink. Hot water is available almost immediately. Larger on-demand water heaters serving multiple uses are centrally located. The primary benefit is reduced energy use from not keeping 35 to 50 gallons of water hot all the time.

If a heat pump is used, especially a ground-source heat pump, a desuperheater can be used to provide hot water. Heat, normally wasted in the summer, is used to heat water. During the winter, water is heated for one-half to one-third the cost of conventional electric heaters.

Because water heating is needed year around, solar water heating is often a cost-effective option.
See also:
www.eren.doe.gov/buildings/home_saving.html

13. What are window shading recommendations for Kansas?

Shading on south windows is best done with overhangs. Because the winter sun is low in the sky, it can enter southern windows. During the summer when the sun is higher in the sky, the overhang shades the windows. Overhangs are built as part of the roofline and are difficult to add once a home is built. To provide shading on existing south windows, consider adding awnings.

Overhangs do not provide adequate sun control on east and west exposures. Use of trees or other plantings that respond to the seasons are best. While it takes several years to gain the full benefit of many landscape changes, mature trees will shade the roof, providing even greater cooling relief.

14. What are recommended R-values for ceiling, wall, floor, and basement insulation in Kansas?

The table below provides "Minimum" and "Better" recommendations for insulation levels. The "Better" levels generally correspond to EPA Energy Star™ performance levels, and should be used to achieve higher levels of performance or where energy prices are high.

	Minimum			Better		
	Southeast	Central	Northeast	Southeast	Central	Northeast
Ceiling	38	38	38	38	38	49
Wall	13	15	20	16	19	22
Floor	19	19	19	19	19	19

15. What type of insulation works best in wall applications?

Three types of insulation are commonly used for wall cavities: fiberglass, cellulose, and spray foam. Properly applied, they are all excellent products. Wall insulation is usually considered to provide a thermal barrier between the inside and outside. However, spray foam and cellulose also provide air-sealing benefits. They are applied after wiring and plumbing rough-in is complete, and seal common air-leakage paths. Fiberglass is also applied after rough-in but does not generally provide natural air sealing. However, other air-sealing techniques should be applied with all three products so good performance walls can be achieved.

In order of cost, fiberglass is usually the least expensive, cellulose next, and spray foam the most expensive.

To obtain more than R-13 wall insulation in 2x4 construction, it is common to add a layer of extruded polystyrene or polyisocyanurate foam insulation outside of the studs and underneath the exterior siding. When foam sheathing is used in place of structural sheathing, it is necessary to brace the wall to resist lateral load.

See also:
www.energy.wsu.edu/buildings/codes.htm

16. What are the most important places to caulk and seal a house?

Air infiltration can account for 30 percent or more of a home's heating and cooling costs, and can contribute to indoor air quality problems. Ceilings, walls, and floor/foundation elements separate the inside conditioned space from the outside, and form the air barrier and insulation barrier for a house. The air barrier is primarily created by the sheet goods (such as drywall, sheathing, and decking), which form the building elements. It is critical to seal all holes and seams between these sheet materials with durable caulks, gaskets, and foam sealants to create a continuous air barrier.

The most serious holes are usually hidden from view, and connect the house to the attic, crawlspace, or basement. The key is to identify these areas during the design and construction process, assign responsibility in the contracts and specifications for sealing work, and then check to see if it was done effectively. Big holes and large cracks are the first priority, followed by smaller cracks and seams.

Modern doors and windows have integral weather stripping and are not likely to be the primary source of air leakage. Many times unseen holes or pathways, called bypasses, occur at key junctures in the framing, and permit large quantities of air to leak in and out of the home. Major floor leakage sites occur around tub drains, plumbing, HVAC, wiring penetrations, and at the rim joist or floor perimeter. In walls, window and door rough openings, drywall, exterior sheathing penetrations, and second-floor perimeter framing are primary leakage sites.

See also:
www.eren.doe.gov/buildings/wthr_sealing.html
www.eren.doe.gov/consumerinfo
www.energy.wsu.edu/buildings/codes.htm

17. How do I compare household appliance energy efficiencies?

Refrigerators, freezers, water heaters, washing machines, dishwashers, room air conditioners, and pool heaters, as well as furnaces, boilers, and central air conditioners have EnergyGuide labels. These labels tell the consumer:

- the capacity of the appliance
- for refrigerators, freezers, dishwashers, clothes washers, and water heaters, the estimated annual energy consumption of the model
- for air conditioners, heat pumps, furnaces, boilers, and pool heaters, the energy-efficiency rating
- the range of estimated annual energy consumption, or energy-efficiency ratings, of comparable appliances
- the estimated annual cost to operate the appliance

Use annual operating costs information from the EnergyGuide label and initial costs to compare different appliances.

18. How do I know how tight to build a new house?

The "tightness" of a home is measured by how many times an hour the air in the house is completely replaced with outside air—air changes per hour (ACH). The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) recommends a minimum of .35 ACH. The actual air-leakage rate changes based on outside temperature, wind speed, appliance operation, and other factors.

One simple way to estimate the tightness of a home is with a blower door. A blower door is a calibrated fan, temporarily installed in an outside door, which de-pressurizes the home. The leakage rate is measured with the fan maintaining a pressure difference between the inside and outside. The average natural leakage rate is then estimated.

Home energy raters have been trained and certified to perform home energy ratings (HERs) that include an evaluation of a home's air tightness. Visit the listed Web sites to learn more about home energy ratings and to find a list of certified raters that can perform a blower door test.

See also:
www.ratingsalliance.org/raters.htm
www.kansasbuildingscience.com/
www.natresnet.org/herseems/default.htm

19. How can I compare the energy efficiency of one house to another?

Home energy ratings (HERs) offer a third-party unbiased assessment of a home's energy performance. A home energy rating evaluates levels of insulation, quality and placement of windows, effects of shading, and air tightness of the home as measured by a blower door. A rating from 1 to 100, indicating the home's overall energy performance, is assigned. A rating of 80 is generally considered to be equivalent to energy code compliance. A rating of 87 or better qualifies the home for an Energy Star™ rating.

Ratings also provide an estimate of the total heating and cooling costs for the home. Using this estimate and projected loan costs, you can determine and compare the true cost of owning and operating an energy-efficient home.

See also:
www.natresnet.org/
www.ratingsalliance.org/

20. What is the recommended ventilation approach for a new house?

The best approach would provide a controlled and appropriate amount of outside air, distributed evenly throughout the conditioned space of the house, enhancing comfort, combustion safety, building durability, and indoor air quality. The approach selected should be based on actual knowledge of the building's air tightness, as assessed by a blower door test, or developed by the experience and performance testing of past construction. The system design should consider the minimum ASHRAE recommendation of .35 air changes per hour (ACH) or the expected occupancy times of 15 cubic feet per minute (CFM). For example, four people x 15CFM = 60 CFM.

There are four options for ventilation of a new house. The first is "natural ventilation," or an uncontrolled approach relying on various air pressure-driving forces to move air through leaks in the building. This does nothing to provide equal or needed air distribution throughout the house. Blower door tests have shown that many homes are inadequately ventilated or, conversely, have excessive leakage and related indoor air quality problems.

A second option is an exhaust-only system. This consists of a central fan or distributed fans exhausting air out of the house. As the fan(s) removes air from the house, fresh air enters through inherent air leaks in the building or small, passive air vents can be strategically placed in several rooms of the house. A key concern with this approach is the importance of using sealed, power-vented, or direct-vented combustion appliances so air is not drawn through these systems, potentially affecting their safe operation. It is also important that air not be drawn in from garages, crawl spaces, or other spaces with pollutant sources that might affect indoor air quality.

A third option is integration with the central heating/cooling system. This approach would typically use a 5- to 8-inch insulated outside air duct connected to the return side-duct plenum of the central air-distribution system, using either the furnace or small duct fan to provide the designed quantity of outside air. A balancing damper should be installed in the outside air duct to adjust the air flow upon system startup, and provisions should be made to filter the outside air prior to its entering the central system.

The fourth option is an integrated mechanical ventilation system with an energy-recovery ventilation unit. When heating and cooling is active, the ventilation air would be distributed throughout the house via the central fan. The central fan recycling system would make sure the ventilation air was distributed when there was no demand for heating or cooling. The purpose of the ERV unit would be to lower the cost of conditioning ventilation air, and, in winter, to recover some interior-generated moisture to keep the house from being too dry.

The control strategy (fan timers, humidity sensors, or other air quality sensors) used to run the ventilation system selected is an important consideration. It should combine the need for automatic controls, assuring continuous ventilation, and allow for manual override when needed.

See also:
oikos.com/esb/39/VentOpt.html
www.healthhouse.org/iaq/buildingscience.htm
www.buildingscience.com/resources/mechanical/
enduse.lbl.gov/Info/ACEEE-Vent.pdf
epb1.lbl.gov/ppt/62/index.htm

21. What is the most efficient form of residential lighting?

Fluorescent lamps offer the highest performance of lamps typically used in our homes. Traditional linear fluorescent lamps, because of the shape of the fixtures, may be limited in application to kitchens, shops, and similar areas. However, compact fluorescent lamps (CFLs) are available as replacements for most incandescent applications. Compact fluorescent lamps cost between $5 and $15 each, but are approximately ten times more efficient and last between 10,000 to 20,000 hours. They are very cost-effective in fixtures that are used a lot but can be cost-effective in other applications as well. While the screw-in CFLs can commonly be used in fixtures designed for incandescent lamps, using fixtures designed for CFLs exploits their high efficiency and provides the maximum light output.

For outside area lighting, high-pressure sodium provides pleasant color and good efficiency. Fixtures and lamps are more expensive than mercury-vapor lamps, but operating costs will be about half.

Conventional fluorescent lamps have limited use outside, because in cold weather they have low light output and sometimes fail to light. However, if low-temperature ballasts and enclosed fixtures are used, they work well. There are compact fluorescent lights designed to start at low temperatures. If these are used in closed fixtures, they achieve full brightness in a few minutes. Incandescent lamps have good color and no start-up delay, but are the least efficient.

See also:
www.eren.doe.gov/consumerinfo/refbriefs/ef2.html
www.energystar.gov/products/

22. Should fluorescent lights be left on if you just leave the room for a few minutes?

Turning fluorescent lamps off and back on does not increase energy use, but it does shorten the life of the lamps. In general, if you will be out of a room for more than about 5 minutes, you should shut the lamps off. Incandescent lamps should be shut off whenever they are not needed.

23. What is radon and how can it be reduced in a new house?

Radon is an odorless, tasteless, colorless, naturally occurring radioactive gas that comes from the rock and soil materials around the foundation of a home. Exposure to radon gas increases our potential for developing lung cancer. Making a new home radon-resistant involves several measures that have proven effective. First, installing a layer of permeable material under the slab or foundation, such as clean gravel or aggregate, or sand and drain tile, or other means provides easy gas movement to a venting pipe. Second, lay polyethylene sheeting on top of the permeable material to act as a gas/moisture-resistant barrier. Third, provide a minimum 3-inch diameter plastic vent pipe from the permeable layer up through the building and roof. Finally, caulk and seal foundation joints and openings to make them gas-resistant.

See also:
www.epa.gov/iaq/radon/construc.html

24. What are the energy code requirements in Kansas for new construction?

Requirements in cities and counties that have adopted energy codes take precedent over state requirements. Many cities have adopted the International Energy Conservation Code. To determine if your community has adopted energy codes, go to www.engext.ksu.edu/.

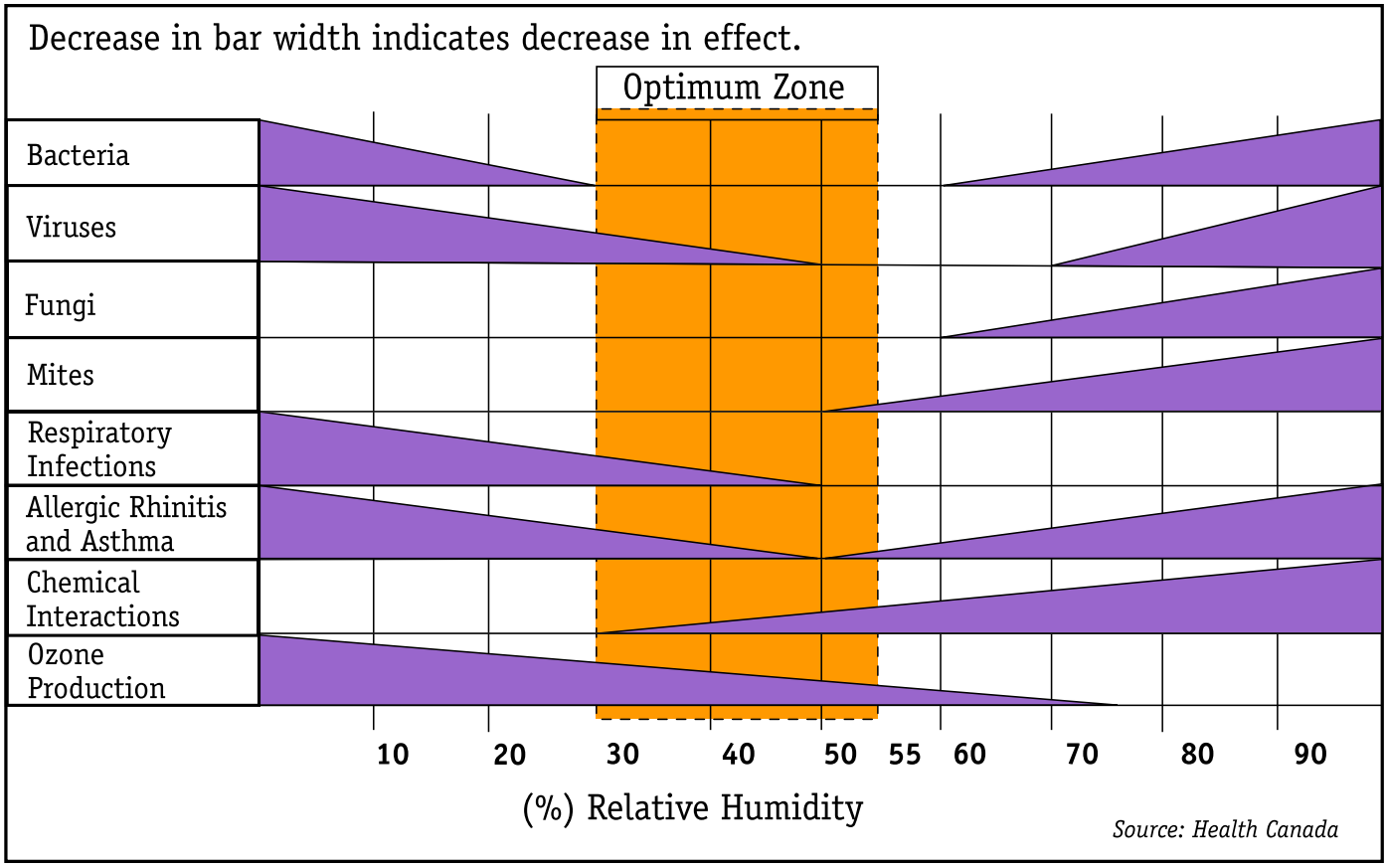
Kansas law requires the builder or seller of a previously unoccupied home to disclose to the buyer that either the home meets the requirements of the 1993 Model Energy Code, or provide a list of energy features including levels of roof, wall, and floor insulation; performance of windows and doors; and level of efficiency of the heating, cooling, and water-heating systems.

See also:
www.kcc.state.ks.us/energy/energyform.pdf/
www.engext.ksu.edu/ees/welcome.htm

25. What is the recommended relative humidity for a house, and how is that related to mold and mildew growth?

Keeping home relative humidity between 30 and 55 percent will do the most to reduce the potential for ill-health effects for occupants, as indicated by the chart below. This is done by controlling sources of moisture, and venting moisture from inside when it is generated by washing, cooking, and other common activities. Although mold and mildew exist in many homes, they can present problems when allowed to persist or spread due to higher humidity, lack of ventilation, or unclean conditions.

See also:
www.epa.gov/iaq/molds/moldguide.html



This material was prepared with the support of the U.S. Department of Energy (DOE) Grant No. DE-FG48-97R802102. However, any opinions, findings, conclusions, or recommendations expressed herein are those of the authors and do not necessarily reflect the views of DOE.