SERVICE IN ACTION
COLORADO STATE UNIVERSITY EXTENSION SERVICE

Residential energy management checklist

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In these times of rising energy costs, the prudent homeowner will want to develop an energy management plan to make wise use of dollars spent on energy used in the home.

The first step in an energy management plan is identifying the problem areas. The next step is listing the problem areas in order of importance according to energy losses involved with each. The final step is to systematically correct these problem areas according to the limits of the household energy improvement budget.

The important point in household energy management is to approach the problem in an orderly fashion and make those corrections that give you the most energy saved per dollar invested in improvements.

Once conservation measures have been completed, alternate sources of energy such as solar or wood heating can be used as appropriate to further reduce conventional energy use. Most homes have some potential for retrofit of solar or wood heating systems.

The use of this checklist is quite simple: answer "yes" or "no" in the blank beside each statement according to whether your house conforms to the statement or not. "Yes" answers indicate areas where the house conforms to energy-efficient principles. "No" answers indicate areas in need of improvement. Thus, this checklist will help you in the first step of an energy management plan by identifying the problem areas.

The items under each topic area are listed in relative order of cost effectiveness; thus, the checklist also helps in the second step of listing the problem areas in order of importance. The final step is up to you—namely, working through the list, step by step, to correct those items that are feasible to undertake so as to make your home energy efficient.

Contact your local CSU county extension agent for other Service in Action sheets that will help you correct problem areas that have been identified.

This checklist can be used for several different purposes:

- By homeowners desiring to make energy improvements.
- By home remodelers wanting to incorporate energy-saving design and construction features.
- By home buyers looking for energy-efficient houses.
- By persons wanting to design their own home.

Siting

How a house is located on a building site and the use of landscaping on a site can reduce energy consumption.

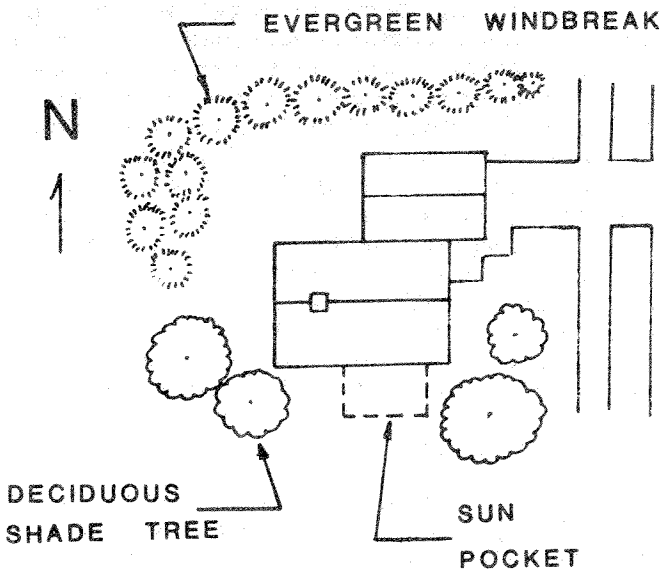

Figure 1: Use of landscaping for energy conservation.

_____ House is located on the south slope of a hill (south slope receives more solar heat in winter and hill protects house from cold north winds).

_____ House is built into a hillside or partially into the ground (the relatively constant year-round ground temperature reduces winter heat loss through below-grade walls and provides a cooling effect in summer).

_____ Long axis of the house runs east and west (allows more windows on the south to utilize solar heating in winter).

_____ Dense evergreen trees (i.e., blue spruce, upright juniper, etc.) or a fence are placed on north and northwest side of house (thus providing a windbreak to reduce the cooling effect of winter winds striking the house).

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_____ Large deciduous shade trees are planted on the southeast, south and southwest side of house (to provide a cooling effect in summer but allow the winter sun to shine through bare branches and warm the house with solar energy).

_____ Low, dense evergreen trees and shrubs are planted close to exterior walls on north and northwest side of house (thus creating a dead air space next to the wall which helps insulate the house).

_____ Dense evergreen trees are planted around entry as a windbreak (to minimize cold air flow into a house when doors are opened).

_____ Deciduous vines are planted on a trellis or against the wall on the southeast, south or southwest side of house (to provide a cooling effect in summer but allow solar energy from the winter sun to warm the house).

_____ Through proper landscaping, a sun pocket is created (to lengthen seasonal use of outside living areas).

House Design

There are many design features that can be incorporated into a new house or when remodeling an older home to promote energy conservation or the use of solar heat. Many of these features can be incorporated in a house at little or no extra expense—merely by thought and planning when designing the house or remodeling job.

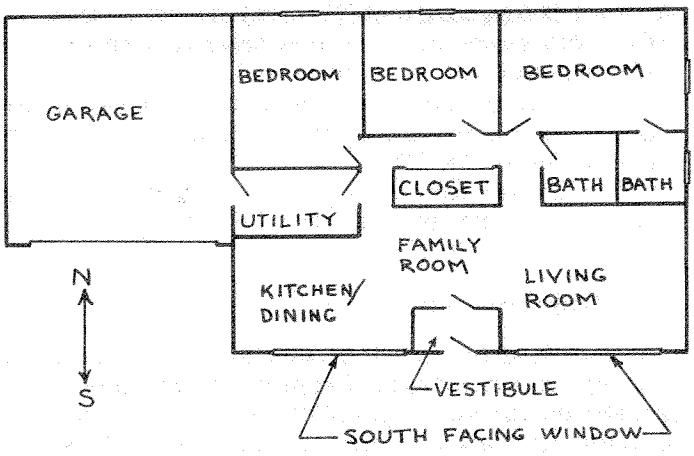

Figure 2: Suggested floor plan for an energy-efficient house.

_____ House has a compact shape. (A circular, square or slightly rectangular house shape is easier to heat because it has a minimum of exterior wall surface and allows more efficient heat distribution.)

_____ House has two-story floor plan (makes more efficient use of heat).

_____ Floor plan locates active areas of house (dining, living, family rooms) on south side and inactive areas (attached garages, bedrooms, workshops, utility rooms) on north side of house. Closets should be located on north walls whenever possible. (Inactive areas can be kept at lower temperatures thus acting as thermal buffers to the active areas which can take advantage of solar heat through south windows.)

_____ Main living area has as few partitions as possible (for best heat distribution in winter and natural ventilation in summer).

_____ Attached solar greenhouse or sunspace is located on south side of house. (This type of structure serves several functions: 1) it provides more living space in the house, i.e. day use, family room; 2) as a greenhouse, it can extend the growing season and provide fresh food for a family; and 3) it can operate as a passive solar collector and provide supplemental heat for the house.)

_____ Total window area is no more than 10 percent of floor area of a house. (Windows have a low insulation value; thus, reducing window area will improve the energy efficiency of a house.)

_____ Maximum practical window area should be located on south side of house. (Solar heat gained through these windows in winter will help heat the house.)

_____ South windows are shaded by a roof overhang, vines or a deciduous tree (to prevent unwanted solar heating from summer sun but allowing solar heat in winter to help heat the house).

_____ North windows are kept to a minimum (since they contribute no solar heat and are adversely affected by cold north winds). North windows should only be installed when necessary for complying with fire codes or to provide ventilation.

_____ East and west windows are kept to a minimum or shaded by deciduous trees or vines, louvers or other shading device (to prevent unwanted solar heat from the morning and afternoon summer sun).

_____ Fireplace is designed with a chamber behind the fire box vented to the room, a glass fire screen covering the opening, a tight-fitting damper and an outside air intake for combustion of wood. (Fireplaces are very inefficient heating devices and can lose more energy than they provide if furnace-heated air is allowed to escape up the chimney. A heat circulating chamber will heat room air. A glass fire screen will prevent heated room air from escaping up the chimney while a fire is burning. A tight-fitting damper will prevent heated room air from escaping up the chimney when there is no fire. An outside air intake will provide combustion air for the fire that has not been needlessly preheated by the house furnace. **Note:** With an existing conventional fireplace, the best improvement is the installation and use of a glass fire screen.)

_____ Chimney for fireplace is placed on an inside wall (so that chimney warmth heats house interior rather than outside air).

_____ Attic vents are located under eaves and at roof ridge (thus, cooler air is drawn in at a low point in attic and hot air exhausted at top of attic; this will vent attics effectively in summer and prevent unwanted heat gains and moisture build-up in winter).

_____ Entry doors are protected by vestibules (to reduce the flow of warm air out of the house when doors are opened).

_____ Stairwells to second floor or basement have solid doors at top or bottom (to control heat flow to these areas).

_____ Entry doors are located on south or east side of house. (Entries are protected from cold winter winds.)

_____ Operable windows are located on southwest and northeast side of house (to provide natural ventilation from prevailing summer breezes from the southwest).

_____ Plumbing fixtures are located close to water heater (to reduce heat losses in hot water pipes).

Construction

Method of construction and type of materials used can have a significant effect on the energy efficiency of a house. The added expense of insulating materials and methods will more than pay for themselves in long-term energy savings. Many of these items can be applied to existing houses on a retrofit basis.

Note: Common insulation R values are as follows: fiberglass bat or blanket (3.0 per inch); cellulose loose fill (3.7 per inch);

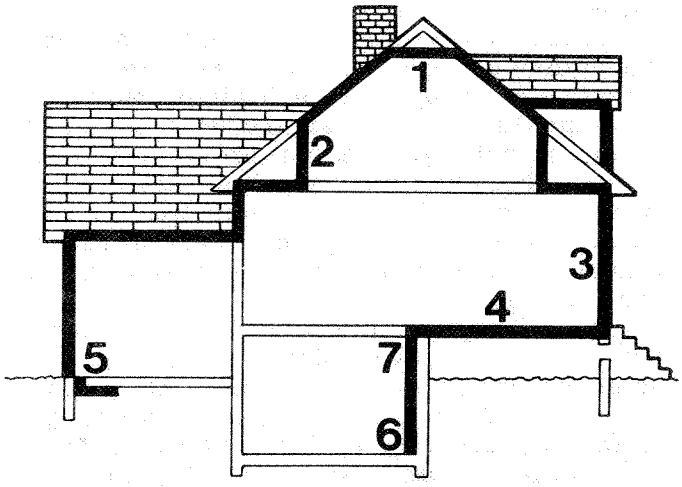

Figure 3: Areas in a home needing proper insulation: 1.) Ceilings with cold spaces above; 2.) Rafters and "knee" walls of a finished attic; 3.) Exterior walls or walls between heated and unheated spaces; 4.) Floors over unheated or outside spaces; 5.) Perimeter of a concrete floor slab close to grade level; 6.) Walls of finished or heated basement; 7.) Top of foundation or basement wall.

_____ Caulking around all household joints is in good condition (not brittle or cracking) and maintaining a tight seal. (To reduce heat loss by air infiltration caulking should be applied wherever two different materials or parts of a house meet).

_____ Weatherstripping is installed around jambs of all doors and operable windows (to insure a weather-tight fit so as to reduce heat loss due to air infiltration).

_____ Ventilators in kitchen, bath or laundry are weatherstripped, have positive closure shutters and are controlled by a timer switch (to prevent backdrafts of cold air and prevent unnecessarily long operation which wastefully removes heated air).

_____ Ceiling insulation has a minimum R-19 rating with R-30 preferred (R-38 in mountainous areas).

_____ Wall insulation has a minimum R-11 rating with R-19 preferred.

_____ Foundation walls in a heated basement are insulated to an R-11 rating.

_____ Floor insulation over unheated areas has an R-19 rating.

_____ Walls in crawl space are insulated to an R-11 rating. (This may be a preferred alternative to insulating the floors in a house if heat ducts and water pipes are located in crawl space.)

_____ Crawl space vents are sealed during heating season. (In a dry climate such as Colorado's, a crawl space does not need to be vented in the winter except in areas with high water tables. Open vents increase heat loss through floors. *Note:* Crawl space should not be sealed if furnace is located there as this would cut off needed combustion air.)

_____ Moisture barrier is laid over ground in crawl space if ground dampness is a problem (to prevent unwanted moisture buildup).

_____ Double-pane glass or storm windows are installed on house. (A double thickness of glass will reduce heat loss through windows by 50%).

_____ Window frames are made of wood or other nonconducting material (to prevent heat loss which occurs with metal frames).

_____ Attic areas are adequately ventilated with one square foot (.09 square meter) of eave inlet and one square foot (.09 sq m) of gable outlet for each 300 square feet (27 sq m) of ceiling area (to allow moisture in attic to escape in winter and reduce heat buildup in summer).

_____ Storm doors are installed on all exterior doors. (Storm doors will reduce heat loss through exterior doors by 35%).

_____ Exterior doors have a solid core or rigid insulation core (for improved R value or resistance to heat flow).

Heating System

The heating system is the largest user of energy in a residence. Proper maintenance, conservation-minded operation and use of energy conserving devices and techniques will assure most effective operation of the unit.

_____ In new construction, furnace is properly sized to match the heat loss of the house. (Most furnaces are grossly oversized which reduces their operating efficiency.)

_____ In new construction, furnace is located as centrally as possible in house (to reduce lengths of ducting or piping and thus reduce heat loss).

_____ Thermostat is maintained at 65°-68°F (18°-20°C) when people are at home during the day or evening. (Keeping the thermostat low is the most cost effective way of reducing heating bills.)

_____ Thermostat is set back at night or when house is unoccupied during the day; with a forced air or forced hot water system, i.e., a system with a fan or pump, the setback can be as much as 10°F (-12°C); with a gravity air or water system, i.e., no fan or pump to move the heated air or water, 3°-5°F (-16° to -15°C) should be a maximum.

_____ Thermostat is set to 55°F (13°C) when house will be unoccupied for over 24 hours.

_____ Rooms are heated only as much as necessary through the use of zone heating controls or closing off individual room dampers. (Unused rooms should not be heated; bedrooms can be kept cooler.)

_____ Furnace filters are changed once a month during heating season. (Dirty filters reduce furnace efficiency.)

_____ Furnace is regularly serviced by a qualified serviceperson. (Oil furnaces should be checked once a year; gas furnaces should be checked every three years.)

_____ Heating system vents in each room are vacuumed periodically and kept free from obstructions, i.e., curtains or furniture (to assure the efficient operation of the heat distribution system).

_____ All joints in sheet metal ducts in a hot air furnace are sealed with duct tape (to prevent leakage and thus reduce heating system efficiency).

_____ Heating ducts or pipes which pass through unheated parts of house (basement, crawl space, garage) are insulated (to reduce heat loss).

_____ Forced air heating system incorporates a dual-speed fan permitting continuous low volume air flow when furnace is not heating, thus providing more uniform heating. (This is an important consideration in homes with tall ceilings.)

_____ Energy-conserving devices (automatic flue dampers, electronic ignition) are added to existing furnaces. (These devices will save energy but are expensive to purchase.)

_____ If considering heating with wood, purchase a well-designed stove that burns efficiently.

Cooling System

Energy for cooling in most of Colorado can be minimized by several of the siting, design and construction methods mentioned in Service in Action sheet 10.605, including landscaping, window placement, proper shading, insulation and attic ventilation. Proper operation of the house combined with the most suitable mechanical cooling device will minimize energy bills for cooling.

_____ Windows are opened in the evening to bring in cool night air. Windows are closed during the day to retain the cool night air and keep out daytime heat.

_____ Insulated, reflective drapes are installed on windows and kept closed during summer days.

_____ A window or room fan is used to draw cooler evening air more quickly through rooms in the house to be cooled.

_____ An attic fan is installed to efficiently draw cooler evening air throughout the house and exhaust heated air from the attic. (This is the most cost effective mechanical device for cooling in Colorado; however, it only works during the evening and night when outside temperatures are less than inside temperatures. The proper way to use an attic fan is to cool the house at night and close it up during the day. Attic fans are not effective where cooling is needed during the day due to climate, poor house design or inadequate insulation.)

_____ An evaporative cooler is installed if more cooling capacity is needed than can be provided by a fan. (Evaporative coolers operate very efficiently in Colorado's dry climate and at less cost than air conditioners.)

_____ Room air conditioners are used only in rooms which must be kept comfortable during the day. (Air conditioners are the most expensive devices to operate for cooling purposes.)

_____ When purchasing a room air conditioner, a unit with the highest energy efficiency ratio (EER) is chosen. (EER is a measure of the operating cost of an air conditioner. EER's range from 4 to 12. The higher the EER, the cheaper it is to operate.)

_____ A central system air conditioner is used when whole house air conditioning is required. (Central systems are more efficient to operate than several room units.)

_____ Air conditioning thermostat is kept at 78°F (26°C) or higher.

_____ Air filters on a central system air conditioner are replaced every one or two months during the cooling season.

_____ Condenser on a central system air conditioner (the unit that is located outside the house) is shaded and condenser coils are kept clean. (A condenser operating in the sun uses more energy; dirty coils restrict air flow and thus reduce efficiency.)

Domestic Water Heating System

Providing hot water for use in a home requires a lot of energy—as much as 25 percent of the annual heating bill. Proper maintenance, conservation-minded operation and use of energy conserving devices will assure most efficient operation of the unit.

_____ Hot water thermostat is maintained at lowest possible setting—120°F (49°C), or 140°F (60°C) if you have an automatic dishwasher. (Lowering the setting not only saves money but will increase the service life of the water heater.)

_____ Hot water system is properly maintained: leaky faucets are fixed; a bucket of water is drained from the tank twice a year (to prevent mineral deposits which lower the efficiency of the water heater); water heater is periodically checked by a qualified serviceperson (whenever the furnace is checked, the water heater also should be inspected).

_____ Hot water is used in an energy-wise manner: flow restrictors installed on showers and faucets, shorter showers, fewer baths, full loads in dishwasher, clothes washed in warm or cold water.

_____ Insulation is added to hot water tank (to reduce heat loss from the tank).

_____ When replacing a hot water heater, an energy-efficient model is chosen.

Now that your home has been evaluated through the use of this checklist, you may want more detailed information on how to incorporate some of the ideas mentioned. There are other Service in Action sheets that give more detailed explanations on how to carry out energy improvements. Contact your local CSU county extension office for titles of interest to you.