

remodeling guide

energy-saving ideas for your home



taking responsibility

As an individual, your efficient use of energy brings benefits such as lower bills, improved comfort levels in your home and a reduced personal impact on the environment.

Acting together, our individual choices add up—for the benefit of our community, our environment and our energy future. That's the power of working together.

As your community energy company, we are committed to sharing our experience and energy expertise. You can always contact us for:

- Answers to your energy questions.
- Energy efficiency information and advice.
- Help in evaluating energy-saving options.
- Assistance in finding energy-efficient products.

Table of contents

Remodeling with energy efficiency in mind	2
Planning.....	2
Gathering information	2
Home Performance testing	2
Choosing a contractor	3
Diggers Hotline.....	4
Relocating or upgrading your MGE service	4
Basic steps for energy-efficient remodeling projects.	6
Your house as a system.....	6
Air sealing.....	7
Ventilation	8
Backdrafting.....	9
Energy efficiency incentives	9
Walls, windows and ceilings	9
Insulation	9
Windows.....	10
Equipment.....	12
Gas vs. electric appliances and equipment.....	12
ENERGY STAR® products	12
Heating.....	12
Cooling	13
Programmable thermostats.....	15
Lighting.....	16
Water heating.....	16
Green remodeling.....	17
Green products.....	17
Passive solar	17
Renewable energy options	18
Room by room.....	18
Kitchens	18
Bathrooms	20
Basements	20
Additions	21
Resources	21

Remodeling with energy efficiency in mind

You've decided to start a remodeling project. A good plan can help ensure that the end result is attractive, useful, safe, comfortable, healthy and energy efficient. Include ideas about energy-saving improvements early in the planning stage. It's easier and less expensive to make these improvements during construction.

Planning

Gathering information

- List likes and dislikes.
- Save magazine clippings, manufacturers' literature and notes from visits to showrooms.
- Check for resources at the library.
- Estimate space needs for the features you want.
- Sketch ideas on paper or use home design software.
- List materials and products needed to complete your project.
- Get prices for items you need.
- Establish a budget.

Home Performance testing

Contact Focus on Energy to have an ENERGY STAR® Home Performance consultant perform a before-and-after home assessment and blower door test. This service identifies conservation measures, estimates energy savings and determines whether changes made during remodeling can affect airflow and pressure dynamics, increasing the possibility that heating equipment can backdraft and spill dangerous flue gases back into the house. Professional testing helps make sure that heating equipment runs safely and efficiently.



Technician conducting blower door test.

The Focus on Energy Home Performance with ENERGY STAR program offers rewards if you complete a home assessment and make energy-efficient improvements (see Resources).

Choosing a contractor

Use these suggestions to find the right contractor.

- Talk to friends and neighbors who have recently remodeled.
- Contact the Madison Area Builders Association or the National Association of the Remodeling Industry (see Resources).
- Select two or three contractors. Ask to see examples of their work. If the contractor can handle the project, ask for a bid. (The more detailed the plans, the easier it is to get comparable bids.)
- Ask about the project schedule and how delays are handled.
- Negotiate the price and payment schedules.
- Review each detail. Get a written contract. Agree ahead of time what constitutes a “change order.”
- Have an attorney review the contract.
- Ask the contractor about subcontractors that will be hired. You may want a product that the subcontractor doesn’t handle.

Diggers Hotline

Call Diggers Hotline at least three working days before you dig, build a fence, dig a trench, excavate or do any outdoor construction or improvements. Your call alerts MGE and other Diggers Hotline participants to mark the location of underground facilities and indicate safe overhead line clearances. For quicker service, call between 11 a.m. and 2 p.m. By calling first you may prevent serious injury, interruption of service and save yourself trouble and expense.

Diggers Hotline gives you a control number and tells you which participants receive your request. MGE marks its lines with a combination of spray paint or chalk plus flags or stakes with attached ribbons. The markings are yellow for gas and red for electricity.

You need to contact other utilities or municipalities that are not Diggers Hotline participants.

Diggers Hotline can be reached 24 hours a day, seven days a week at 811 (TDD number for the hearing impaired is 1-800-542-2289).

Relocating or upgrading your MGE service

If your project includes relocating a meter, upgrading your service or moving power lines, call MGE ahead of time at (608) 252-7222.

Timeline

Your timeline is important to us. The time needed to relocate or install natural gas and electric service depends on weather conditions and the season. Apply early and provide the estimated date you need service changes completed.

If you need to move an electric meter or power line

Electrical inspection permits/affidavits are required for temporary and permanent electric service before MGE can make your connection. Obtain information through the local building inspection office of the city, village or township where your project is located or call MGE at (608) 252-7373.

To move overhead electric service underground, call (608) 252-4732.

If you need to move a gas meter or move a gas line

Requirements for permits vary for each municipality. Obtain information through your local building inspection office.

Contact us early in the process. We may be able to coordinate with your contractor and save you money by having any necessary trenches dug while the equipment is there for other digging. We need a minimum of at least two weeks before you need service.

For service scheduling information, call (608) 252-7157.

Starting service

MGE turns on your electric service after receiving the permanent electric inspection permit. Usually, the electrician contacts the electrical inspector's office to request the permit.

Your gas service cannot be turned on until:

- Your gas appliance is hooked up and vented.
- You have supplied us with a gas space-heating permit for your home.

If your service is with another utility other than MGE, contact that utility directly.

Basic steps for energy-efficient remodeling projects

Your house as a system

Consider your house as a system. It contains many subsystems: walls, roof, windows, insulation, plumbing, electrical, heating, cooling, ventilation, etc. For years, designers and builders thought of these subsystems individually. Now they recognize that subsystems interact with each other to form a complete system. The system should maximize comfort and health, minimize energy waste and moisture damage, and control heat and airflow. If you add basement living space, an addition or remodel the kitchen or bathroom, the changes you make may affect existing subsystems.

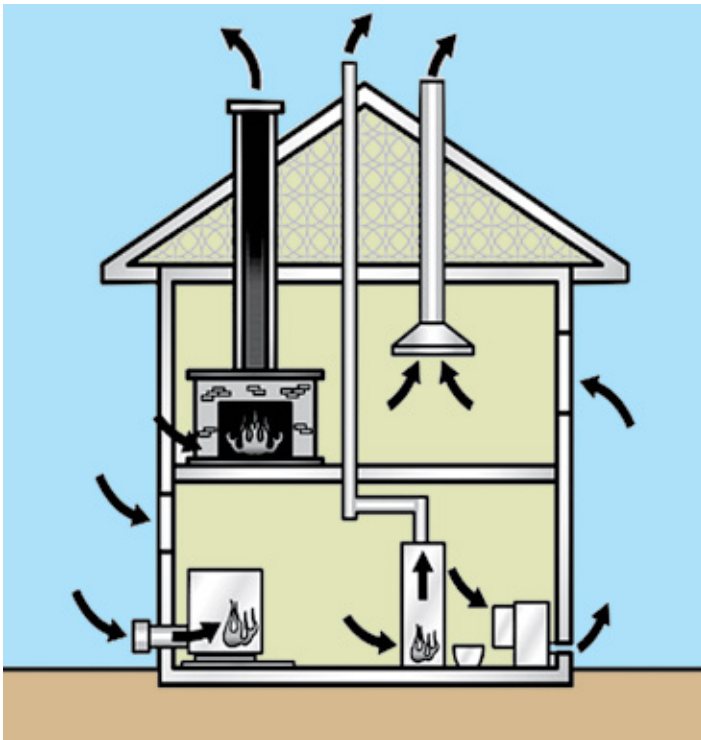
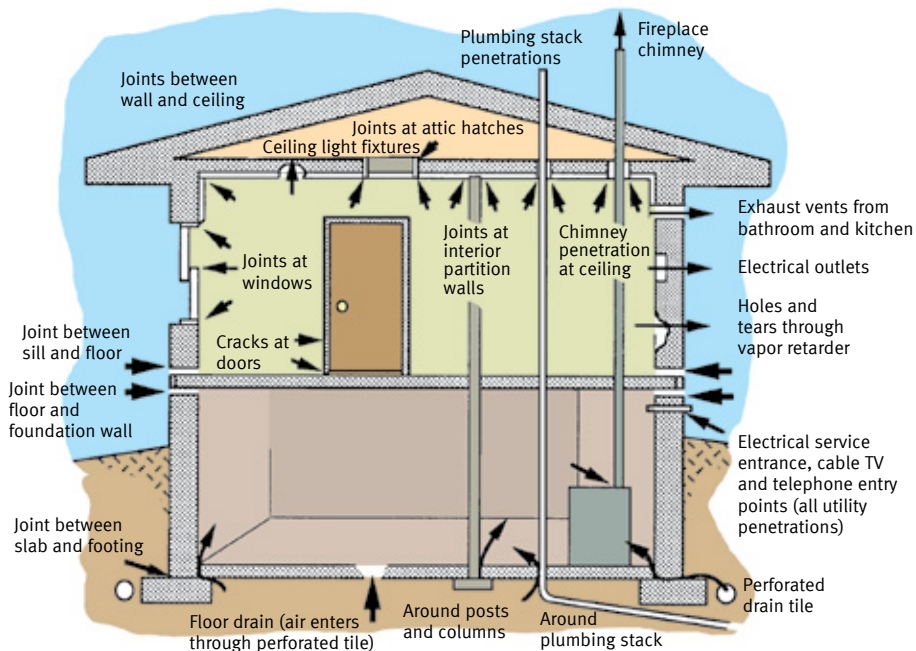


Illustration courtesy of CSIA.

Air sealing

Air leakage can account for 20% to 30% of your heating bill. A blower door test helps locate major leaks and determines how tightly to seal your home. MGE recommends hiring an experienced blower door contractor. Call Focus on Energy at 1-800-762-7077 for more information.



If you plan to open walls, remove woodwork or add new space:

- Fill openings between the casing and framing around windows and doors with low-expansion foam or packed insulation. (Beware of doing this to rope and pulley windows. Insulation may interfere with weights.)
- Seal around the outside of electric outlet and switch boxes. Specify sealed outlet/switch boxes or “polypan” and require that the contractor foam-in boxes, seal wire penetrations and seal vapor barrier to boxes.

- Seal gaps behind cabinets and above soffits and false ceilings. Drywall before soffits are installed.
- Seal around penetrations through walls and ceilings. Seal wiring, plumbing and exhaust vent penetrations.

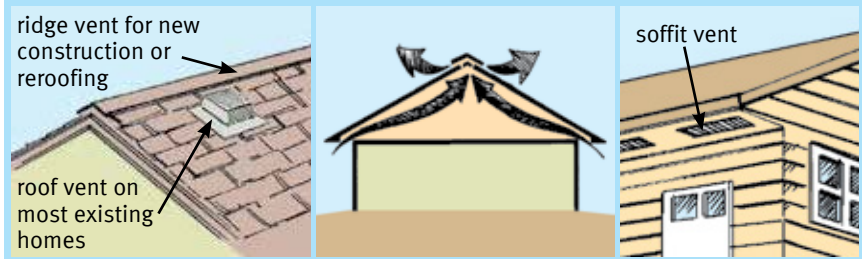
Ventilation

Reduce air leakage to reduce drafts, improve comfort and save money, but consider the effect on the rest of the house or other parts of the system. Adequate ventilation is important to control moisture and odors. Ventilation also minimizes the load on air conditioners by removing heat and moisture.

Proper attic ventilation requires a balance of intake and exhaust openings. At least half the venting should be in the soffits to draw air into the attic. Gable or roof area vents allow air to escape.

Ventilation chutes placed between the rafters improve airflow, protecting insulation and walls from moisture.

MGE does not recommend powered attic fans. They can depressurize the attic and create moisture problems. Natural passive vents cause fewer problems.



- Ask your HVAC contractor to balance heat distribution throughout the house after your project is complete. Balancing improves energy efficiency and comfort.
- Add ventilation or replace existing bath or kitchen fans with quieter units designed to run continuously to facilitate moisture removal and provide good indoor air quality.

- Vent exhaust fans to the outdoors to avoid condensation in the attic.
- Consider a whole house ventilation system to maximize control and comfort in houses with very low air leakage.

Backdrafting

If a vented kitchen fan, the dryer and an open hearth fireplace are used at the same time, the exhaust gasses from a chimney-vented water heater or the fireplace may be pulled back down the chimney and into the house.

To determine if the possibility exists for backdrafting, have a before-and-after blower door test performed by an ENERGY STAR-certified consultant.

Energy efficiency incentives

Focus on Energy

Focus on Energy, a public-private partnership, offers energy information and services throughout Wisconsin. Rewards are available on eligible lighting and furnaces (see Resources).

Walls, windows and ceilings

Insulation

Update the existing amount of exterior wall and attic insulation in your home based on these recommendations:

- The minimum insulation value is R-19 in walls and R-38 in the attic.
- Existing exterior walls that are exposed to the studs during remodeling should be insulated to at least the minimum values with no gaps or spaces around studs or obstructions.

- Install a plastic vapor barrier on the warm side of the insulation to prevent moisture penetration and buildup in closed areas.
- Seal attic air leaks before you add more insulation.
- Vent attic areas above the insulation to prevent moisture damage. Install vents to equal one square foot per each 300 square feet of attic floor area.

Expanded foam insulation provides the best R-value per inch and infiltration

reduction. Fiberglass or dense-pack cellulose insulation are a close second. Before you add living space to a basement, read MGE's *Finishing Basements* fact sheet. Also, for more information on sealing air leaks and types of insulation, read MGE's *How to Insulate Your Attic* brochure (see Resources).

Insulation material	R-value per inch
Blanket/Batt fiberglass:	
Standard density	3.2-3.5
Medium density	3.8
Mineral wool	3.5
Loose fill:	
Fiberglass	2.5-3.0
Mineral wool	3.3
Cellulose	3.7
Rigid board:	
Expanded polystyrene (beadboard)	3.8-4.4
Extruded polystyrene	5.0
Fiberglass drainage	4.0
Polyisocyanurate	6.0
Spray-in-place insulation:	
Damp spray cellulose	3.8
Fiberglass	3.8
Polyurethane (foam)	6.2
Polyisocyanurate (foam)	3.6

Windows




Buying new, energy-efficient windows can reduce energy costs, but it takes at least 20 years to recover the cost. Beware of inflated claims of “up to” 40% or more energy savings. Replacing all the windows in a house rarely saves more than 10% or 15% of the home's heating bill.

There are other reasons for replacing windows:

- Better comfort.
- Easier maintenance and cleaning.
- Existing windows are beyond repair.
- Improved resale value.

Other considerations that may influence your decision:

- How long you plan to live in the house.
- When you plan to purchase new heating or air-conditioning equipment. (New energy-efficient windows may allow you to buy smaller-capacity equipment that costs less.)

ENERGY STAR® Qualified in Highlighted Regions	
	
	World's Best Window Co. Millennium 2000+ Vinyl-Clad Wood Frame Double Glazing • Argon Fill • Low E Product Type: Vertical Slider (per NFRC 100-97)
ENERGY PERFORMANCE RATINGS	
U-Factor (U.S./I-P)	Solar Heat Gain Coefficient
0.30	0.30
ADDITIONAL PERFORMANCE RATINGS	
Visible Transmittance	Air Leakage (U.S./I-P)
0.51	0.2
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. Consult manufacturer's literature for other product performance information. www.nfrc.org</small>	

Look for this label instead of “center of glass” ratings.

Look for the ENERGY STAR symbol when purchasing new windows. If comparing two or more ENERGY STAR windows, compare the NFRC labels. The NFRC rating includes the frame, glass and edge spacers to arrive at an overall energy efficiency rating for the window. The lower the NFRC-rated U-factor, the better the energy performance.

Windows are sometimes advertised using R-values at the center of the glass. This rating doesn't provide a true picture of how efficient the whole window is. To avoid confusion, ask for the NFRC rating or U-factor of the window.

Proper installation is necessary to reduce the possibility of moisture problems and infiltration. See MGE's *Windows* brochure for more information (see Resources).

Equipment

Gas vs. electric appliances and equipment

Are you remodeling a laundry room? Install a gas dryer or have the piping done for a future purchase. A natural gas dryer operates at one quarter the cost of an electric dryer. A gas water heater costs about half as much to operate as an electric water heater. The piping will be less expensive if it's done while the contractor is already there. MGE provides free pipe installation estimates for gas dryers, ranges, fireplaces or grills. Call 252-7333.

ENERGY STAR® Products

Look for this symbol when you shop.

ENERGY STAR-labeled products use less energy, cost less to operate and help protect the environment. There are ENERGY STAR products in the following categories: appliances, heating and cooling, home electronics, office equipment and lighting.



Appliances that are ENERGY STAR-rated include:

- Refrigerators and freezers
- Dishwashers
- Clothes washers
- Dehumidifiers
- Room air conditioners

Heating

Home remodeling, especially an addition, can affect your heating system. Ask a heating contractor to determine whether modifications need to be made. In most cases, upgrade your system after all shell measures (insulation and air sealing) are completed.

- You may need a smaller system if you've reduced your home's heat loss. A smaller unit can save money and run more efficiently if it is sized correctly. Many older furnaces are oversized and can heat additional spaces.
- Insulation added throughout your home may help stretch your furnace's heating capacity.

MGE recommends purchasing an ENERGY STAR-certified furnace.

A high-efficiency heating system can:

- Increase safety. (Reduces the danger of backdrafts.)
- Eliminate costs to repair a chimney. (Many new furnaces and water heaters do not require a chimney.)
- Reduce heating costs if previous furnace was lower efficiency.
- Conserve natural gas and reduce pollutants.
- Increase your home's resale value.

If a new high-efficiency unit is not an option, supplemental heating equipment may be needed. Ask a heating contractor about your options.

Cooling

Central air conditioner

Need to replace your central air conditioner? MGE recommends an ENERGY STAR-certified air conditioner.

Tell the contractor about existing air circulation problems and any home addition plans so the air conditioner can be sized correctly. If the unit is too small, it may not cool the home on hot days. If it's too large, it will cost more to purchase, cool rapidly without dehumidifying and run less efficiently.

Whole house fan

A whole house fan pulls cool air in through open windows and doors and expels hot air through attic vents. It cools the entire home. Whole house fans are far less expensive to operate than central air conditioners. A mid-efficiency air conditioner costs about \$150 per year to operate, while a whole house fan costs about \$25 per year.

Whole house fans are sold by most home building centers and some department stores. Electrical and carpentry skills are required to install the fan. Ask the dealer for details. This cost-effective alternative



Caution: Always open windows or doors before turning on a whole house fan.

to central air-conditioning is installed flush to the ceiling just below the attic. Read MGE's *Whole House Fan* fact sheet for more information (see Resources).

Other systems

For houses without forced-air heat, air-conditioning is still possible. Attic ductwork or ductless split systems can be added.

Attic-mount system

This system has the condensing unit outdoors. The condensing unit sends cold refrigerant to an evaporator coil and blower located in the attic. The cool air is distributed through small ceiling vents. The special ductwork and blower in the attic add to the expense.

Ductless split system

A ductless system uses an outdoor condensing unit connected up to three wall units, each with its own evaporator coil and fan. These wall units are connected to the outdoor condensing unit by a small hose running through the wall, so no ducts are needed. The wall units look like wall-mounted room air conditioners, only thinner. This type of air conditioner allows you to cool rooms individually. Ductless systems can be quite expensive. Read MGE's *Air Conditioner* brochure for more information (see Resources).

Programmable thermostats

Even if you are not replacing your heating or cooling system, you should

Set back	8 hours per day	16 hours per day	24 hours per day
5°	5%	10%	15%
7°	7%	14%	21%
11°	11%	22%	33%
13°	13%	26%	39%

install a programmable thermostat. It offers convenience, savings and keeps your home comfortable. Set it to turn on the heat before you get out of bed in the morning or before you come home in the evening. A setback thermostat never forgets to change the temperature. Install the thermostat using the instructions that come with it or hire a heating contractor.

In the winter, save energy by setting back the temperature when you're asleep or not at home. Every 1 degree you lower the thermostat for eight hours saves about 1% on your heating bill. (Setting up the temperature for summer air-conditioning saves a similar percentage.) An average MGE customer can save \$40 to \$100 per heating season by doing setbacks, if health permits. The longer your house remains at the lower

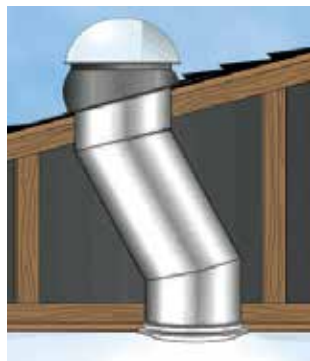
temperature, the more you save. Contrary to belief, it does not cost more to heat a home back up after a setback.

Lighting

Replace existing incandescent fixtures and bulbs with new ENERGY STAR-certified lighting to save money.

ENERGY STAR lights save up to 75% in electricity costs compared to regular lightbulbs and last much longer.

Manufacturers have improved the light color, added features (three-way or dimmable) and developed bulbs that work outside in cold weather. They also have improved the design, style and selection of the fixtures. Read MGE's *Lighting* brochure for more information (see Resources).



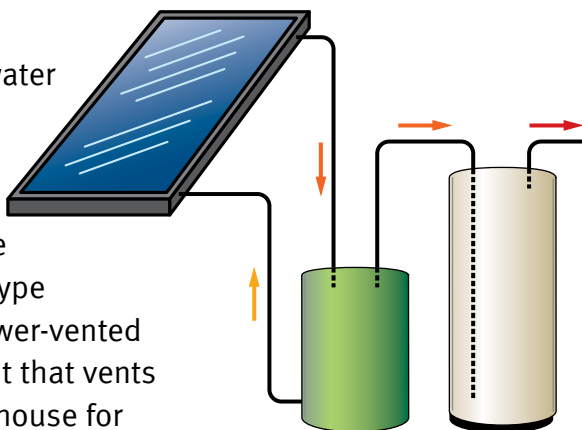
Tubular skylight (light pipe)

When you are thinking about lighting for your project, consider the effect of curtains, awnings, landscaping, skylights and windows.

Water heating

Buy a natural gas water heater if possible.

Gas heats water at half the cost of electricity and twice as fast. For a tank-type unit, consider a power-vented or direct-vented unit that vents out the side of the house for combustion safety. Look for an ENERGY STAR-certified water heater. Consider an on-demand (tankless) water heater. These heaters are up to



Solar water heaters typically consist of a roof-mounted collector and storage tank in the house.

25% more efficient than a tank heater but currently cost about twice as much. Read MGE's *Water Heaters* brochure for water heater comparisons, sizing and life-cycle cost information.

Green remodeling

The Green Remodeling Guide available at *greenbuildingadvisor.com* is a good resource.

Green products

Reuse building materials from your existing home and choose green or recycled products and materials to reduce waste going to landfills and save valuable resources. Some recycled products, such as decking materials, are maintenance-free.

The Habitat for Humanity ReStore sells excess new supplies and used building materials to the general public. They also accept donations of supplies (see Resources).

Passive solar

Improve daylighting, shading and direct-gain heating with passive solar techniques. Consult with an experienced passive solar designer to avoid problems.

- Sunrooms are a common addition to enhance the look and feel of a home. Install ENERGY STAR windows and include a plan for shading (deciduous trees or window blinds) to prevent heat gain in the summer.
- Newer windows, specifically designed for cold climates, let solar heat in and limit heat loss. Windows that face the sun gain heat and add light, reducing lighting costs.
- Be sure to include operable windows for summer ventilation.

Renewable energy options

- Focus on Energy offers incentives to customers interested in using solar electric, solar water heating or a wind electric system.
- Federal tax credits to homeowners who install solar electric or solar water heating are due to expire Dec. 31, 2016. See *energystar.gov* for details.

Room by room

Kitchens

Kitchens are one of the most likely rooms to be remodeled, and usually have energy-saving opportunities.

Appliances

Refrigerators

- Replace your old refrigerators built before 1993. New refrigerators use half as much electricity.
- Look for the ENERGY STAR label.
- Use the yellow Energy Guide labels to compare. Ice makers and water dispensers cost more to operate.
- Allow space in your kitchen plan for at least two inches of clearance around the refrigerator. Heat needs to escape from the compressor and condensing coils.
- Locate away from heat sources such as the stove, oven or heat register. Avoid direct sunlight.
- Don't buy a refrigerator bigger than you need.
- Recycle the old refrigerator. Focus on Energy has rewards for recycling refrigerators and freezers.

Dishwashers

- Look for the ENERGY STAR label.
- Use the yellow Energy Guide labels to choose the model with the lowest operating cost. Choose a quiet dishwasher.

Ranges, ovens and microwaves

- Choose a natural gas range and save. Natural gas cooktops and ovens cost half as much to operate as electric ones. Plan ahead for gas piping.
- Convection ovens use less energy than conventional ovens. However, convection ovens cost more, and you may need a separate cook top.

Exhaust fans

It is important to exhaust excess moisture and odors to the outdoors. It minimizes the load on air conditioners by removing heat and moisture.

- Look for kitchen exhaust fans with a minimum of 150 cubic feet per minute (CFM) capacity.
- Install exhaust fans with spring-loaded dampers and some (sound level) ratings of 1.5 or less for quiet operation.
- Vent exhaust fans outdoors to keep moisture out of the attic.
- Range hood vents are the most effective exhaust systems, while downdraft vents are least effective. Avoid recirculating range hoods, especially for gas ranges.

Task and accent lighting

- Choose ENERGY STAR-certified lighting for general use. For ceiling fixtures or cove lights above cabinets, use four-foot tubes.
- Provide task lighting over islands, cooktops, counters and dinette areas.

- Use insulation contact (IC) rated, airtight recessed fixtures to prevent heat loss, moisture problems and drafts. Choose ENERGY STAR-certified recessed fixtures or “cans” for general or task lighting. Use just one or two recessed lights with standard incandescent or halogen parabolic (PAR) lamps. Excess heat will increase cooling costs.

Bathrooms

Moisture control, maintaining a comfortable temperature and good air quality are important concerns for bathroom remodeling. Mold, mildew and rot can occur from excessive moisture or if moisture migrates into exterior walls.

- Seal around all plumbing penetrations in the walls and floors including the hole in the subfloor around the tub drain.
- Replace or add insulation to exterior walls.
- Insulate and install an air barrier along the wall behind the tub or shower.
- Install a good exhaust fan with a low sone (sound level) rating of 1.5 or less for quiet operation.
- Install a WaterSense-labeled showerhead to reduce water and energy costs.
- Choose ENERGY STAR-certified lighting fixtures.

Basements

Finishing a basement can create more living space but it can be a challenging project. Studies of some common finishing techniques found that they can contribute to moisture buildup and mold growth. Mold is a special concern because it can cause health problems. See MGE’s *Finishing Basements* fact sheet for detailed information.

Additions

Planning a major addition? Refer to MGE's *New Home Planner* for construction details. This 95-page publication provides an overview of the building process and includes sections about wall construction, insulation, ventilation, appliances and lighting. MGE customers may request a free copy by calling the Home Energy Line at 252-7117 or visiting mge.com/newhomeplanner.

Resources

Energy Efficient Rehab Advisor

rehabadvisor.pathnet.org/index.asp

Describes the U.S. Department of Housing and Urban Development's (HUD) guidelines for conducting energy-efficient housing rehabilitation.

Green Building Advisor Green Remodeling Guide

greenbuildingadvisor.com/green-basics/green-remodeling-guide

REGREEN Residential Remodeling Program

regreenprogram.org

Habitat for Humanity ReStore

restoredane.org

(608) 661-2813

Sells used and surplus building supplies.

Home Magazine

homemag.com

Home Energy Magazine

homeenergy.org

Focus on Energy

focusonenergy.org



focus on energysm

Partnering with Wisconsin utilities

MGE partners with Focus on Energy to bring energy-saving resources and incentives to our customers.

(800) 762-7077

Home Energy Saver

hes.lbl.gov/

A web-based do-it-yourself energy audit tool.

National Association of the Remodeling Industry (NARI)

- NARI Green

greenremodeling.org

- Madison Chapter

remodelingmadison.org

(608) 222-0670

National Kitchen and Bath Association (NKBA)

nkba.org

No Regrets Remodeling, 2nd Edition by the Editors of Home Energy Magazine

MGE publications available online at *mge.com/brochures*:

- *Air Conditioners*
- *Appliance Energy Costs*
- *Caulk and Weather Strip*
- *Check With the Experts*
- *Exterior Wall Insulation*
- *Finishing Basements*
- *Furnaces*

- *How to Insulate Your Attic*
- *Lighting*
- *New Home Planner*
- *Whole House Fans*
- *Windows*

Or call the MGE Home Energy Line at (608) 252-7117 to receive copies by mail.

listening. learning.

MGE takes responsibility to provide information and education to serve our customers and stakeholders. We educate customers today to help inform their decision making. We educate tomorrow's stakeholders so they can help plan our energy future.

One of the most important steps you can take to save energy when remodeling is to seal major air leaks and then add insulation. *Working together we can make a difference.*

Contact us for information about:


- Heating/Air-conditioning.
- Insulating/Weatherizing.
- Lighting.
- Windows/Doors.
- Appliances.
- Water Heating.

Get more home energy information at:

- mge.com/home.
- Home Energy Line 608-252-7117.
- 800-245-1125.

Questions about billing? Call:

- 608-252-7222.
- 800-245-1125.

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