

Selecting Ranges and Ovens

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Often cooking is done by more than one person in the household. Purchases of new equipment should suit all users. This folder includes information on electric, gas, and wood ranges and ovens.

HEAT SOURCES

Cooking involves the transfer of heat into food. Usually the heat source is an electric element, a gas burner, or a wood fire. In range top cooking, the heat is usually transferred from an element or a flame through a pan surface to the food. In oven cooking, the heat is transferred to the food through heated air from an element or flame and radiated from hot oven walls. In broiling, heat is radiated directly to the food from the element or from the flame, burner, and the baffle or shield behind the flame. Microwave heating¹ uses electrical energy to heat the food directly; induction heating units² use electrical energy to heat the cooking pan on the top of the range and the heat is transferred to the food.

SPEED OF HEATING AND RETENTION OF HEAT

Using similar appliances, the speed of heating foods will vary with the kilowatt rating and the design of the unit, or the BTU/hr rating of the burner and the design, as well as the choice of cooking pan.

Gas burners provide instant heat and retain little heat after the burner is turned off. Electric heating elements require a short time to heat up and retain heat after the unit is turned off. A glass-ceramic surface over the element such as in a smooth top range will require more heat up time and will retain more heat. Many cooking tasks can be finished using only

retained heat. Wood ranges require a long time to heat but retain heat. Induction elements provide instant heat in the pan—the only heat in the range surface is conducted from the pan. Microwave heating provides fast heating of the food. In most pans used in microwave heating the only heat in the pan is conducted from the food.

INSTALLATION REQUIREMENTS

Gas ranges and ovens require the installation of gas lines and either LP or natural gas, and operate on 110-120 volt circuit for electric ignition and clocks, automatic oven controls and fans.

Electric ranges and built-in ovens must be connected to a 110/220 — 120/240 volt circuit; portable cooking appliances operate on a 110-120 volt circuit.

Wood ranges require wood, a Class A chimney, stove pipe, floor protection, and specified clearance space between the range sides and nearby walls and cabinets.

SIZES AND CONFIGURATIONS

Free-standing. These are usually 30 inches wide (a few models are 20, 24, 36, or 40 inches), 36 inches high, and 27 inches deep. Some free-standing ranges have double ovens side by side or, if upper and lower, they may be called split level or consoles. The clearance space between the upper oven and the surface units or burners varies from 11 to 19 inches. Clearance space is important when canning or cooking in large kettles.

Slide-in and drop-in (slip-in). The slide-in is essentially the same as a free-standing range without finished sides. It is designed to fit between cabinets and give the appearance of a built-in. They are usually 30 inches wide, though a few models are 19, 21, or 24 inches wide. They are usually 24 inches deep and flush with the cabinets. The drop-in is like a slide-in without the base support structure. It is supported by the counter top and can be several inches lower or higher than a free-standing range.

¹ Microwave energy causes rapid movement of moisture and fat molecules in food, resulting in heat.

² A magnetic field over the coil under the ceramic surface INDUCES a current in the bottom of the pan; if the pan is of steel or iron it resists the flow of current and heat is created.

Built in. The oven usually requires 24 inches of wall space. The units or burners are set into the corner and require cut out space 19-21 inches deep and 26-36 inches wide. Models with features such as a gridle, grill, or barbecue unit may require more than 36 inches. The barbecue unit may be a separate unit heated with gas or electricity. Common sizes are 20 inches deep and 20 or 30 inches wide. Installation requirements will specify distance between a barbecue unit and a combustible wall. If space is not available, the wall must be noncombustible (such as stainless steel or ceramic tile). An exhaust system is essential with an indoor barbecue.

RANGE AND COOKING TOPS

Most cooking is done in pans over gas burners or conventional electric surface units. Some manufacturers of electric ranges and cook tops offer the modular concept; these are components such as grill or rotisserie units which can be exchanged with standard surface units.

Gas burners can be adjusted to any number of settings between off and high by turning the burner control which regulates the flow of gas.

Most electric surface units today have infinite heat control. They can be adjusted to any number of settings between off and high. The unit cycles off and on at full wattage, and the length of the off and on time periods is regulated by a dial. On the highest setting, the unit is on all or nearly all of the time; on medium settings, the unit is on about half of the time; and on low settings, the unit is on one-fourth or less of the time (maintaining a boil on a low setting will use 25 percent or less energy than used to maintain a boil on a high setting).

Units and burners may be thermostatically controlled with an infinite number of temperature settings. A thermostat responds to a central sensitive disk in contact with the cooking pan bottom. The burner will have a full or minimum flame as needed to maintain the desired temperature. The unit will be on a full wattage only as needed to maintain the desired temperature.

Smooth tops. The smooth top has electric elements which heat the glass-ceramic smooth surface. The units have either thermostatic controls or infinite heat settings.

The surface temperature of units with thermostatic controls may reach 575°F. The surface temperature of the units with infinite heat settings may reach 975° to 1000°F. The higher the surface temperature, the greater the amount of retained heat. Units with infinite heat settings have a faster recovery rate in cooking. Once the desired temperature is reached, usually 5 minutes or more of cooking can be done on "Off."

Utensils used on smooth top ranges should be flat and without ridged bottoms. Some utensils such as pressure saucepans are slightly concave. If the concavity of the bottom of the utensils exceeds 1/16

inch, the heating will be noticeably slower. For efficient transfer of heat there must be contact between the entire pan bottom and the heated smooth top.

Slower heating, due to poor contact, would be very evident with large amounts of food and thermostatically controlled units with their lower maximum surface temperatures. The heat control unit is usually more satisfactory for canning.

A special cleaner-conditioner for smooth top ranges is available. This will clean and protect the surface. The surface also can be cleaned with baking soda, a *mild* cleanser, or soap and water and *rinsed well*. DO NOT USE heavy duty cleansers and rust stain removers; they will etch the surface.

The surface should be clean before the unit is turned on. All pans used on the surface should have bottoms free from grease and soil. Avoid spillovers of sugary foods; these are especially difficult to remove.

Induction unit. This unit heats cooking pans rather than the range surface. Induction coils are located under the glass-ceramic surface. When the unit is turned on, alternating current flows through the coils. The changing magnetic field over the coil induces a current in the bottom of the pan. If the pan is of *steel* or *iron*, it resists the flow of current and the pan heats. No heating occurs in a copper or aluminum pan because these materials are such good conductors of electricity. Steel pans with aluminum or copper cores will heat very well; however, steel pans with aluminum or copper **BOTTOMS WILL NOT HEAT**. The iron or steel pan may have an exterior finish such as porcelain or have a non-stick interior finish. No heating occurs in glass or ceramic pans because these materials have such high resistance to the current that very little or no current flows; glass-ceramic is used for the cook top surface. Induction heating is fast and even, pans can become very hot, and a low settings is needed to prevent scorching of puddings and sauces.

Wood range. A wood fire heats the top smooth surface. The temperatures of the top surface depend upon the amount and type of wood and the rate of burning. Many wood ranges are a combination with standard electric units or gas burners.

OVENS AND BROILERS

Ovens usually have both baking and broiling capabilities; separate appliances may be used for broiling or grilling. Conventional ovens, convection ovens, and microwave ovens are all available; microwaves may be combined with either conventional or convection ovens.

Conventional oven. Temperature settings may be selected between 140 and 550°F. Thermostats, responding to the air temperatures in the oven, cause the oven element or oven burner to cycle on or off. New UL Standards specify that the exterior temperature of the oven (range and built-in) may not exceed 131°F., when the oven is at an interior temperature of 400°F.

Convection ovens. Convection ovens transfer heat by forced air currents. The moving air currents speed up heat penetration.

Heating in convection ovens is usually done for shorter times and at temperatures 25-50°F. lower than in conventional ovens. Some convection ovens have small cavities; however, with forced air circulation food can be heated on several racks at one time. Do not block the hot air circulation by placing pans so that they touch each other or the side walls of the oven. Proper rack placement in convection ovens is important, especially in those ovens where all the heated air enters the oven from the top. The air may be heated by an electric element or a gas burner. Electric elements are located either inside or outside the oven cavity.

Convection ovens may be part of a range or a counter top unit. Ovens in electric ranges operate on 110/220 - 120/240 volts. Portable convection ovens operate on 110-120 volts and usually draw 1500-1600 watts and should be connected to a small appliance circuit. If used on a general purpose circuit, do not use any other heating appliance on the circuit at the same time. Gas range ovens or counter top ovens operate on either natural gas or propane.

Microwave ovens. Microwave cooking appliances are available as microwave ovens and microwave-conventional or convection-microwave ovens. Basic operation and selection considerations are discussed in Extension Folder 353, *Selecting a Microwave Appliance*.

Automatic oven controls. Ovens may be operated manually or automatically. Timing and thermostat controls enable starting, stopping, or changing the cooking process automatically. A delay-cook feature should be used with caution. Many foods held in warm (40-140°F.), moist conditions for more than 3-4 hours are not safe to eat. Foods that need special care are eggs and egg-rich foods, meat, poultry, and fish.

Automatic oven cleaning. Ranges may have one of two ways of automatic "oven" cleaning. In the continuous clean method, soil burns off at baking temperatures of 350°F. or above. On this specially-designed surface, food spills spread out thinly. The higher the oven temperature the faster the stains are removed. **THE OVEN SURFACE WILL NOT BE SPOTLESS.** Manufacturers differ in their care directions. Usually large spills on the continuous clean oven surface can be removed with plastic or nylon scrubbers (without cleansers) and water or with spray-on/wipe-off cleaners. Do not use cleanser, soap-filled steel wool pads or oven cleaner. These either leave a residue or damage the surface.

The high temperature or pyrolytic method of oven cleaning is available in electric ranges at all price levels but generally on only the medium-priced and expensive gas ranges. This method burns off soil by heating the oven to temperatures of 750°F. to 1100°F. Oven racks and reflector pans, EXCEPT

THOSE OF ALUMINUM, may be cleaned in the oven. Broiler pans should NOT BE CLEANED IN THE OVEN since grease on them could ignite. The cleaning cycle takes 2 to 3 hours. Ovens using the high heat method of cleaning must be well insulated. The 1973 UL Standards specify that the exterior temperature of the oven cannot exceed 150°F. during the cleaning process. This method of cleaning uses as much electricity or gas as 3 to 4 normal baking operations of 30-60 minutes, about 3-4 kilowatt hours or 24-38 cu. ft.

Broilers and barbecue grills. Broiling effectiveness is determined by the amount and distribution of radiant heat. The kW or BTU/hr rating affects the amount of available heat; the design of the burner in a gas broiler and the heating of artificial lava rocks in barbecue grills affects the distribution of heat. Most gas broilers and grills have the capability of radiating heat faster to the surface of the food than do electric broilers and grills. "Convection broiling" transfers heat to the surface of food by forced air currents rather than by radiation from the element or burner.

Broiler burners vary from 16,000-19,500 BTU/hour. Broiler elements in range ovens vary from 2500-3800 watts; the elements in portable ovens vary from 1000-1600 watts.

Most broilers have only one setting, a maximum air temperature of about 500° to 550°F. Temperature adjustments in cooking are made by lowering the shelf on which the broiler is placed. Some gas broilers are located below the oven and use the oven burner; other broilers are located in the oven and operate with a separate broiler burner with a baffle or shield.

ENERGY CONSUMPTION OF RANGES AND OVENS

Any energy claim made by a manufacturer, distributor, or retailer must be based on Department of Energy (DOE) tests; portable conventional or convection ovens are excluded from this ruling. Although many new appliances have energy labels indicating average annual cost of operation, there are no labels on ranges and ovens. According to the Federal Trade Commission (FTC), it would not be economically feasible to require labels for ranges and ovens because the energy used in cooking varies most with operator use and less with the efficiency of the appliance.³ The DOE will be establishing minimum energy efficiency levels for gas range tops and gas and electric ovens.

New gas ranges have electric ignition in place of pilot lights.⁴ Ovens in efficient gas or electric ranges have increased amounts of insulation; all ovens that self-clean by the high temperature method are well insulated.

³The FTC reported maximum energy savings \$6-7 per year with efficient appliances.

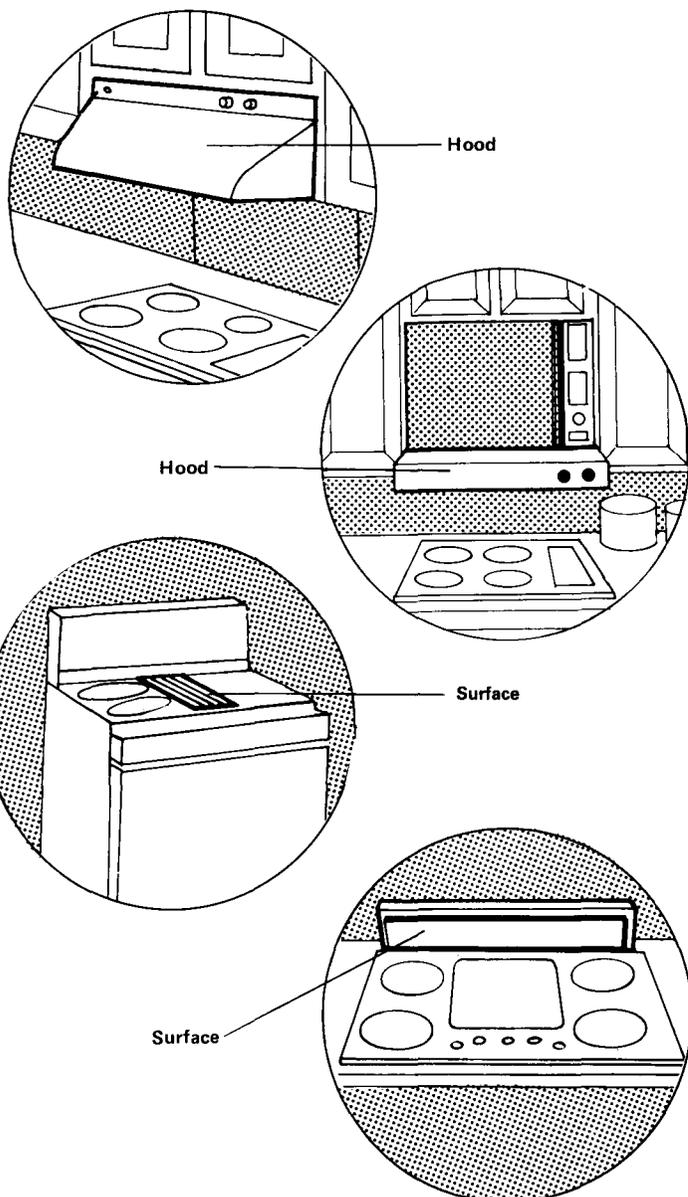
⁴All new gas ranges sold in Minnesota after January 1, 1979, have electric ignition.

VENTILATION SYSTEMS

This may be a separate installation or be a part of a range and be located over the range top or be a part of the range top (surface or down draft venting). Ventilation systems are of two basic types: nonducted, those that remove grease and smoke; and ducted, those that remove grease, smoke, water vapor, and some heat. The ducted system helps in controlling moisture levels in homes with a low level of air exchange, ½ air exchange/hr., (tightly insulated).

Ventilation systems are rated in cubic feet of air per minute (CFM); the higher capacities needed for barbecue grilling units are available in the ducted

Hood ventilation systems are located over the range top. Surface ventilation systems are at or near surface height.



types. A manufacturer's specified maximum duct length for efficient operation is based on the diameter of the duct work and the number of elbows installed.

Hood fans are much more efficient than comparable wall or ceiling fans because hoods trap the smoke and grease-laden air before it circulates to the rest of the room. Wall or ceiling fans must be located so that the air they exhaust is drawn directly over the top of the range. HUD requires that wall or ceiling fans are not more than 4 feet from either side of the center of the range top.

The hood fan capacity needed is determined by the size of the hood. Kitchen Industry recommendations are 100 CFM for each lineal foot except that peninsula and island hood fans should be increased to 120 CFM per lineal foot. The corresponding Housing and Urban Development (HUD) minimums are 40 CFM per foot, increased to 50 CFM in an island or peninsula location, and at least a 450-600 CFM rating over an indoor barbecue.

The wall or ceiling fan capacity needed is determined by the volume of the room and desired number of air changes to remove odors and smoke in kitchens. HUD recommends a minimum of 15 air changes per hour:

$$\text{CFM} = \frac{\text{cu. ft. of room} \times 15 \text{ desired air changes/hour}}{60}$$

Surface or down draft ventilation systems are built into or attached to ranges or range tops. The capacity is sized to take care of the cooking needs of the particular ranges.

SAFETY AND PERFORMANCE

Check for the safety seal of the Underwriter's Laboratories (U.L.), (for fire, electrical shock, and related accident hazards), and on gas appliances for the certification seal of the American Gas Association (for safety and/or performance and durability). For operational problems unresolved by the reading of the instruction manual, the dealer, or manufacturer, contact the Major Appliance Consumer Action Panel (MACAP), 20 No. Wacker Drive, Chicago, Illinois 60606.

Ranges are expensive appliances; they vary from \$200-\$1300 with many costing \$350-\$700. Most new ranges have a one-year warranty; some parts such as the magnetron tube in a microwave oven may have a five-year guarantee on parts. Service contracts are available; the cost of these increases with the age of the appliance and varies from \$30 to \$50 per year.

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