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## Heating with gas

### A guide to choosing furnace size, efficiency, and features.

Replacing or improving a furnace may not pay off as handsomely as it did during the energy crisis of the late 1970s. But it may deliver steady, modest savings. And efficient heating isn't only about money. Because today's furnaces burn less fuel to generate heat, they are less polluting than their predecessors. Some models also produce heat more continuously than older furnaces, increasing comfort.

Heat pumps that wring heat from the ground or from outdoor air (and reverse the process in summer, to act as an air conditioner) are the preferred way to heat in the South and Southwest, and oil furnaces have a niche in older homes, mostly in the Northeast. But the majority of new central-heating systems use a gas furnace, the focus of this report.

### THE BASIC CHOICES

How do most people go about buying a furnace? First, they contact contractors. To prepare this report, we did, too. More than 500 specialists in residential heating and air conditioning told us about their experiences in installing and maintaining heating equipment.

The two major manufacturers of gas furnaces are United Technology (Carrier, Bryant, Heil, Tempstar, and Comfortmaker brands) and Goodman (Janitrol and Amana). Other brands include Rheem (Ruud), American Standard (Trane), and Lennox (Armstrong). All offer furnaces in a range of capacities and efficiencies, and we think manufacturers generally deliver on those specifications. Each brand offers a generally similar array of key features.

The degree of similarity between manufacturers' offerings is one reason this report does not include Ratings of furnaces by brand. The most important steps in selecting a furnace, we think, are to ensure that the unit's specifications fit your needs, that it is bought from a contractor who installs it well, and that it's adequately maintained. Our survey results help confirm that view: When we asked about the most common reasons for service calls for furnaces, about twice as many contractors we surveyed cited human error--inadequate maintenance, for example, or improper installation--as cited defective equipment.

**A CLEAN SWEEP? Duct-cleaning services typically promise to rid your heating system of bacteria or other harmful contaminants. Yet there's little evidence such cleaning is needed, except perhaps as part of an allergy-control program prescribed by a doctor.**

**If you do get the service, insist on a thorough job; in a pilot project, the Environmental Protection Agency found it took 16 to 30 worker-hours to clean the ducts of a typical home.**

**For more information, check the Environmental Protection Agency pamphlet "Should You Have the Air Ducts in Your Home Cleaned?" at [www.epa.gov/iaq/pubs/airduct.html](http://www.epa.gov/iaq/pubs/airduct.html).**

### REPLACE OR REPAIR?

If your furnace falters or fails, a few simple procedures may save you the cost and trouble of seeking professional help:

- If you're getting low airflow, check the air filter on the furnace; a clogged filter could cut airflow to a trickle.
- See if there are loose wires or a malfunction in the thermostat. For an electronic thermostat that runs on batteries, try changing them.
- Are fuses burned out or circuit breakers tripped? If so, power may have been cut to the fan or circuit board.

If those steps don't work, call a heating contractor. Despite the improved efficiency of most new furnaces, it's generally more cost-effective to repair a furnace than to replace it. However, if a key component such as the heat exchanger or control module fails, you're probably better off replacing the furnace, especially if the unit is more than about 15 years old (furnaces typically last an average of 15 to 18 years).

## HOW LARGE A FURNACE?

When it comes to furnaces, size counts--a lot. A furnace that's too small won't keep the house comfortable during extreme cold. Partly to avoid that possibility, contractors sometimes sell furnaces that are too large for the home they're installed in. Cost is only one of the problems with such a unit. Compared with a correctly sized furnace, a furnace that's too large will cycle on and off more frequently. That puts more wear on its components, wastes energy, and may cause the temperature to vary uncomfortably. Also, upgrading to a larger furnace may require the installation of bigger ducts to accommodate the increased airflow.

To be sure of correct sizing, choose a contractor who agrees to take the time to calculate heating needs using an industry-standard calculation, such as found in the Air Conditioning Contractors of America's Manual J. Such calculations take into account the climate, along with the house's size, design, and construction.

## WEIGHING EFFICIENCY

The more efficient a furnace, obviously, the lower your energy bill for heating. Calculating a furnace's energy costs requires considering both the gas it burns and the electricity it consumes to run its blowers and controls.

How efficiently a furnace converts gas into heating energy is reflected in its annual fuel-utilization-efficiency (AFUE) rating, which is measured as a percentage. The higher that percentage, the more heat the furnace can wring from each therm of gas--and the lower the environmental impact of its emissions.

Furnaces have generally become more energy-efficient over the years. A typical gas furnace made in the early 1980s has an AFUE of about 65 percent. Today, the lowest efficiency allowed by law for new gas furnaces is 78 percent, and the most efficient models have an AFUE of about 97 percent--or near-total efficiency.

The price of a furnace generally rises in step with its fuel efficiency. A furnace with a 90 percent AFUE can cost about \$1,000 more than a similarly sized unit with an 80 percent AFUE. However, that additional cost can generally be recouped in lower fuel bills over the lifetime of the furnace. Just how quickly the investment is recovered, though, depends on more than the difference in AFUE between the two units; the electrical bills to run two furnaces with different AFUEs can differ significantly. Payback times will also be affected by the climate where you live, how well your home retains heat, and the rates you pay for gas and electricity.

## VENTING AND REPAIRS

You may also need to consider your home's vents and chimneys when you are purchasing a new furnace. Replacing a low-efficiency furnace with one that has an AFUE of 90 percent or more will require installing a vent that meets the special needs of a high-efficiency furnace. Furthermore, if other appliances (a gas-fired water heater, for example) share a vent or chimney with the old furnace, they, too, may need new or modified venting. All this work can easily add hundreds of dollars to the installed cost of a new furnace.

Also, one-third of the contractors we surveyed said that the most efficient furnaces (those with an AFUE of about 90 percent or more) tend to need more repair than other models. We think that's partly because very high-efficiency furnaces tend to have more components that can break down and are more likely to use new designs that are not yet tried and true. (More than half of the contractors we surveyed also cited new furnace models as prone to need more repair.)

Many contractors also said that the lowest-efficiency furnaces--those with an AFUE of 78 percent--are more likely to require repair than others. These least-efficient furnaces may not be the best choice for any home.

## CHOOSING EFFICIENCY

To help you decide on a level of efficiency for your new furnace, insist that the contractor select models in a range of efficiencies. Have the contractor calculate the annual estimated operating cost of each model you're considering, rather than simply estimate it. He can complete these calculations by plugging information on the unit's AFUE and electrical consumption, on local utility rates, and on characteristics of your home into one of several computer programs designed to make such estimates. Make sure the installation quotes also consider the cost of any changes to venting required by any appliances in the home.

Weigh the operating costs of the various furnaces against their price and features. Since more-efficient furnaces generate fewer emissions, environmental considerations may also weigh in your decision.

Given that most furnaces with an AFUE over 90 percent are quite expensive, they're likely to be economic only in regions where winters are especially harsh--including most of the Northeast and Midwest. Also, given the reliability indications for such models, it's wise to ask the contractor some additional questions about one you may be considering: Is the model fairly new (say, two years or less) and thus relatively untested? If it's an older model, has the contractor noticed any reliability problems with it?

## CHOOSING THE CONTRACTOR

Most furnaces are sold through contractors who are usually trained to install and repair the brands they sell. The contractor typically helps you choose the right-size unit for your home and will install it (and usually service it, too).

In the end, it's the contractor who will make the biggest difference in how well the furnace replacement goes. Ask friends, co-workers, and your local gas utility for recommendations (some utilities install and maintain furnaces themselves). Check the yellow pages for additional names.

Get bids from at least three contractors, especially if you don't have a strong personal recommendation for one company. If state or local laws require one, make sure the contractor has a valid heating contractors' license, and ask for proof of insurance. Look for a contractor whose qualifications blend training, certification, and on-the-job experience. Ask if the technicians who will work on your home are certified to install a furnace or if they plan to get certification from programs such as North American Technician Excellence (NATE).

Last of all, be wary of bids that are considerably below the others; the contractor may be cutting corners in ways that compromise the system's effectiveness. Once you select a contractor, ask for references and check them. Then check for any complaints with the Better Business Bureau before signing a contract.

Plan on having your furnace replacement done in the off-season. You'll have more time to choose a contractor and negotiate a price. Contractors can be more flexible when they don't need to respond to a backlog of emergency no-heat calls.

### Higher efficiency, higher usage

With the appliances that heat homes becoming steadily more efficient--gas furnaces especially--you might assume the total energy used to heat homes is also dropping. Instead, the energy used for space heating is actually growing by about 3 percent a year. That, in turn, has helped increase emissions of carbon dioxide, the greenhouse gas produced when furnaces, space heaters, and power plants burn coal, oil, and natural gas.

The main culprit: Bigger homes. Relatively low energy costs, too, have reduced the financial incentive for choosing a more efficient furnace. Governments and utilities have also reduced or eliminated many of the rebates they once offered to homeowners who chose more-efficient heating systems. Fortunately, many of those agencies still provide information that educates consumers about steps to reduce energy use in their homes. One of the best sources is the Department of Energy (800 363-3732; [www.doe.gov](http://www.doe.gov)), whose web site provides interactive worksheets and links to other online information.

Here are some steps that can help you make your home more energy-efficient:

- Turn down the temperature a little. Keeping your home two degrees cooler will reduce emissions by about 6 percent and save you money. You may not notice the difference, especially at night or when you're out of the house (a programmable thermostat can help).
- Draw the curtains. A heavy curtain can block the chill from a cold window, so you won't need to raise your thermostat to feel comfortable. You may even find that you can maintain your comfort at a lower thermostat setting, thereby saving even more energy.
- Reduce heat loss from ducts. The Department of Energy estimates that 20 percent to 40 percent of the heating energy that leaves the furnace of a typical heating system dissipates in its duct system. Limit those losses by sealing leaks and, where feasible, insulating ducts.

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