

# HOME ENERGY GUIDE

## FURNACE REPLACEMENT

Most furnaces have a useful life of 15-20 years, depending on conditions. Furnaces in buildings that are leaky and poorly insulated will run more frequently than those in tighter homes—and will have a shortened expected life or higher repair costs. Poor maintenance can also cause early failures in furnaces.

### When to replace?

A furnace may be the most expensive piece of equipment in most homes, and deciding when to replace it is a significant decision for homeowners. Having to buy a new furnace in January after the old one has unexpectedly died may not lead to the best choices for you and your home. Instead, start your research in advance, based on:

- **Age.** As your furnace approaches the end of its expected life, start planning your replacement strategy, including not only what to buy but how to pay for it.
- **Expensive repairs.** Even if the furnace may have more years of expected life, spending 25% or more of the cost of a new furnace on repairs may be an indication it is time to replace rather than repair.
- **Poor energy efficiency.** Furnaces that deliver 80% AFUE (annual fuel utilization efficiency) or less efficiency are costing you real dollars in fuel use. An increase in efficiency to 95% may easily pay for itself during the life of the new furnace.

### What to look for in a new furnace

There are several things to consider when shopping for a new furnace:

#### Efficiency

Higher efficiency furnaces will provide ongoing benefits including lower energy bills and reduced environmental emissions. Going from an 80%

efficient furnace to a 95% efficient model could save several hundred dollars a year in fuel costs (depending on many factors). Some furnaces can deliver over 98% efficiency.

#### Proper sizing

A common concern when purchasing a new furnace is determining the proper size for a given home. Be wary of being sold a unit that is larger than what was there previously—oversized furnaces cycle more frequently, causing extra wear and actually lowering the comfort level—and will be more expensive to purchase. Also avoid automatically installing the same size furnace as what is being replaced—especially if significant improvements to the building (additional insulation, air-sealing, new windows) have been implemented since the old furnace was first installed. The building code requires a heat-loss calculation based on the size of the house, the insulation levels, the number windows, previous energy bills, etc. Insist on a heat-loss calculation worksheet as part of any contract.

#### Ductwork sizing

New high efficiency furnaces typically move air at a higher speed than older, less efficient furnaces. To ensure the furnace will run at its highest efficiency, the ductwork must be properly sized for the furnace. Properly sized ductwork reduces the pressure on the blower motor (increasing its life) and improves comfort in the home. Whenever a new furnace is installed, the ductwork (including baffles and registers) should be examined to make sure airflow is not restricted.

#### Blower motor

The blower motor operates the fan that distributes heat throughout the home. Older furnaces typically had one speed that would come on as soon as the thermostat called for heat and run until the furnace was cold. Significant advance-

(over)

ments have been made in the past few years in blower motor design and operation, improving efficiency and comfort. Variable speed motors (controlled electronically) automatically adjust the flow of the blower motor to changing conditions and use up to 60% less electricity. They also increase comfort by reducing the rush of cold air at the beginning and end of the cycle.

Another option when reviewing blower motors is to add electronically commutated motors or ECM motors. These motors are more efficient than a variable speed blower motor and can reduce fan noise considerably.

### Sealed combustion

New high efficiency furnaces no longer take room air for combustion or allow exhaust gasses to rise naturally up a chimney. A sealed combustion furnace keeps the airflow of combustion completely separated from the interior air of the house. This accomplishes several things essential to the safety and efficiency of the furnace:

- **No backdrafting.** Fresh air is drawn in through a plastic PVC pipe, delivered to the combustion chamber where the fuel is burned, and the exhaust gasses are vented directly to the outside through a similar plastic PVC pipe with the aid of a fan. As the connections in this system are tightly sealed, the dangers of backdrafting as a result of

the operation of the furnace are essentially eliminated.

- **Increased efficiency.** Because the airflow to and from the furnace can be tightly controlled, the ability to provide maximum efficiency in the combustion process is enhanced.
- **Lower flue gas temperatures.** Because more heat is being extracted from the combustion process (through a secondary condensing heat exchanger), less heat is going out the exhaust. This lowers the flue gas temperature, allowing it to be vented through the PVC piping. This lower temperature also reduces risks associated with hotter flue gasses.

Additionally, high efficiency furnaces use electronic ignition (rather than a pilot flame) to ignite the fuel. Further electronics manage the air/fuel mixture and ensure efficient and safe operation under a wide range of conditions.

#### Furnace efficiency savings: an example

Calculators (available online) can help determine potential energy savings between different furnace efficiency standards. The following example was based on a calculator from the Center for Energy and Environment (mncee.org).

Assumptions. The example included these basic characteristics of a sample home; your numbers may be different:

- Located in Twin Cities metro
- Built between 1960-1969
- Square footage between 2,500-3,000
- Comparison between 80% and 95% AFUE natural gas furnaces
- Gas cost of \$0.77/therm

Results. These are the annualized numbers from the calculator:

Efficiency:	80%	95%	Savings
Therms:	2,396	2,017	379
Dollars:	\$1,844	\$1,553	\$291
CO2 Lbs. :	26,520	22,340	4,180

In this example, a savings of nearly \$300 a year (at present costs) translates into \$4,500 over a 15+ year estimated life of the furnace—enough to cover the additional cost of the more efficient furnace several times over.