

Determining the efficiency of your furnace, boiler

By CCHRC staff

The "Ask a Builder" series is dedicated to answering some of the many questions Fairbanks residents have about building, energy and the many other parts of home life.

Q: What is AFUE, and what does it mean for my furnace or boiler?

A: AFUE stands for Annual Fuel Utilization Efficiency and is listed on the energy tags for furnaces and boilers. AFUE is meant to provide an average of the space heating efficiency you can expect from the heating appliance during the year. If you are in the market for a furnace or boiler or you are wondering about the efficiency of an appliance you own, the AFUE is a good starting point. However, it is important to understand how it is measured, because it might not provide an accurate assessment of the efficiency of your home's heating system.

There are several different types of efficiencies that are used to describe combustion and electric furnaces and boilers. There is the combustion efficiency, which measures how effective the heating appliance is at converting fuel into heat. A heating contractor can measure combustion efficiency in the field: the test involves measuring the concentrations of different gases, such as carbon dioxide, in the exhaust. Often, a contractor will measure the combustion efficiency during a routine maintenance check-up.

Another efficiency is the steady-state efficiency, which is the efficiency of the appliance when it is fired continuously after it has warmed up. You can think of this efficiency like the gas mileage of your car driving on the highway.

In contrast, the AFUE is the seasonal efficiency, so it represents the efficiency of the appliance including when it is cycling off and on to provide heat during the winter. You might liken AFUE to your average gas mileage including when you are driving in stop-and-go traffic. For this reason, the AFUE always will be less than the steady-state efficiency of the appliance.

AFUE is determined in a lab, using a procedure established by the American Society of Heating, Refrigeration and Air-Conditioning Engineers Inc. Since all furnaces and boilers that use fuel oil, natural gas or electricity as fuel undergo the same test to determine AFUE, ASHRAE had to design the procedure so that it compared each appliance under conditions commonly encountered in the United States — in other words, under conditions much warmer than our climate in Alaska. The procedure also assumes averaged parameters for when the appliance will cycle on and cycle off, what the room temperature is and how oversized the appliance is (many houses have heating appliances that can provide more heat than the house needs). For this reason, AFUE is an indication of the seasonal efficiency of a furnace or boiler installed in an average house in America.

Unfortunately, your house might not be like the average American home (for one, in Alaska, houses are in a much colder location than average).

Still, AFUE is a good number to look at when you want to compare different models of furnaces or boilers. The test to determine AFUE provides a "level playing field" for these appliances, so their seasonal fuel use can be compared. It does not, on the other hand, predict the efficiency of any appliance in a particular installation.

That efficiency is affected by the distribution, the control system, how often the appliance is maintained, and other case-specific variables. Consequently, it is important to install properly and maintain your own system, in addition to choosing an efficient appliance, to achieve a high seasonal efficiency.

Ask a Builder articles promote home awareness for the Cold Climate Housing Research Center. If you have a question, contact us at info@cchrc.org or 457-3454.

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