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Air-Conditioning, Heating, and Refrigeration Institute

September 30, 2010

Ms. Abigail Daken
U.S. Environmental Protection Agency
ENERGY STAR HVAC Program

Re: ENERGY STAR Product Specification for Furnaces—Version 3.0: Draft 1

Dear Ms. Daken,

The Air-Conditioning, Heating, and Refrigeration Institute (AHRI) is the trade association representing manufacturers of air conditioning, heating and commercial refrigeration equipment. AHRI's furnace manufacturer member companies account for nearly 100 percent of the residential gas and oil furnaces sold in North America. We have developed the following comments on the Draft 1 Version 3.0 product specification for ENERGY STAR qualified furnaces:

1. One of the goals of this ENERGY STAR product specification for furnaces is to identify a tier of furnaces utilizing high efficiency blower fans. The use of Annual Electrical Energy Consumption (AECR) to accomplish this goal is significantly complex and more comprehensive than required. Furthermore, using AECR as a metric for furnace fan efficiency is not appropriate due to the following reasons:

    - Climate differences result in the heating load hours and cooling load hours that vary by region.
    - Usage patterns can vary due to personal choice of ventilation, filtration, set point, and closed register adjustment.
    - There is variability associated with installations including restrictive duct work, indoor air quality equipment and oversized equipment.
    - Rated airflow for specific heating and cooling capacities varies by manufacturer.
    - AECR can vary widely depending on the appliance type. AECR depends on components that are matched with the air handler to comprise the system.

    We recommend that a steady state descriptor be used since it can be applied to various regions of the country (similar to the miles per gallon rating for automobiles). The "***e***" is a relevant efficiency descriptor that should be used (details are below).

2. AHRI recommends the use of "***e***", a dimensionless descriptor that is dominated by the air moving device within a furnace. It is a descriptor that has been known in the industry for more than five years, and is currently used for federal tax credits. The "***e***" designates furnaces whose electricity consumption is 2% or less of the furnaces total energy use, according to the U.S. Department of Energy's (DOE) official test procedure, and is determined according to the following formula:

   (Eae x 3413) / [(Eae x 3413) + (Ef x 1,000,000)] ≤ 2%

   Such furnaces typically employ a more efficient motor on the circulation fan and can significantly reduce electricity use during the heating season compared to models of the same AFUE and capacity that do not meet the guideline, especially when the circulating fan is operated on its own for ventilation, air circulation, or filtration. The electricity saved during each heating cycle is offset, on a site energy basis, by an equivalent increase in fuel use.

   The guideline does not ensure electricity savings during the cooling season. For cooling season electricity savings, specify a furnace-air conditioner combination with a Seasonal Energy Efficiency Rating (SEER) that exceeds the federal minimum.

   "***e***" is a much simpler than AECR, and is an established descriptor that creates a convenient way to identify a tier of furnaces utilizing high efficiency blower fans. Since "e" is already available and appropriate, it is a better choice than AECR for use in the Version 3.0 specification.

3. The ENERGY STAR product specification identifies the draft CSA Standard C823 as a test standard for measuring AECR. AHRI does not support the use of a draft standard as a test method reference. Stakeholders involved in the development of Standard C823 have identified significant issues that need to be resolved before the final version is published. EPA's stated intention is to realize energy savings as soon as possible and, to that end, is interested in finalizing, releasing, and implementing the Version 3.0 specification as quickly as possible. Including a reference to a draft test standard yet to be finalized and published is contrary to this objective. Furthermore, given that DOE is developing a federal test procedure, we believe it is premature for EPA to propose the adoption of the draft CSA standard. AHRI urges EPA to postpone any further consideration of the AECR metric until DOE publishes a final rule.

4. The ENERGY STAR requirements for AFUE in the U.S. North and U.S. South regions should be the same. Cooling drives a higher percentage of the energy usage in the U.S. South, where incentives are usually based on the efficiency of the cooling system. High efficiency cooling systems typically require the use of high efficiency indoor fans, and are usually available with a furnace or air handler equipped with an energy efficient fan. Therefore, a separate level for furnaces that serve southern climates is not necessary.

5. EPA has identified the following annual full load heating and cooling hours in the Version 3.0: Draft 1 specification for furnaces:

   U.S. North—2400 hours for heating, 310 hours for cooling
   U.S. South—1700 hours for heating, 460 hours for cooling
   U.S. National Average—1970 hours for heating, 399 hours for cooling
   Canada—2000 hours for heating, 400 hours for cooling

   We recommend that EPA reference the source(s) behind these full load heating and cooling hours in Version 3.0: Draft 2.

6. AHRI has developed the following comments on the draft CSA Standard C823:

   - The Standard applies to Canadian climate, which is significantly different from U.S. climate. The Standard assumes a duct work sized for heating airflow. Although this may apply to climate conditions in Canada, it is not applicable for U.S., where the common practice is to size the duct work for the cooling airflow. The use of the system load curve in standard C823 leads to the dependency of the cooling rating points on the selection of the heating rating points. In the application of this method to practical examples, the cooling rating points fell outside the manufacturer's recommended range of operations. Standard C823 requires manufacturers to report static pressure rating points outside the manufacturer's recommended ranges. This requirement may lead to improper installation practices and higher electrical energy consumption.

     AHRI is of the opinion that the criteria for performance curves in C823 are not well defined. The number of performance curves and their range of operation are subject to interpretation. More performance curves lead to more energy descriptors, increased manufacturer test and reporting burden, and may overwhelm consumers during the selection of equipment. Performance curves should not condone installations where static pressures are outside the recommended ranges of operation. AHRI recommends a single rating point. If Standard C823 or a modification of Standard C823 is adopted, then performance curves can be defined by taking data points at 0.2 inH_2O increments, and not exceed the manufacturer's recommended maximum. Additionally, the Standard needs to provide further clarification on the testing and reporting of furnaces that use variable speed blowers.

   - The reporting templates in Annex A and Annex B of the Standard require manufacturers to report multiple AECR values for various appliance types, thereby creating a possibility of wide range of AECR values. AECR depends on components that are matched with the air handler to comprise the system. Installers and consumers may find it difficult to effectively use the Standard because of the technical complexity associated with the ratings prescribed in Section 4.

- Standard C823 does not clearly indicate how the heating and cooling speeds are selected in order to determine AECR, especially in variable speed applications. Section 8.2, Full load heating mode, is inconsistent with the Annex A which lists AECR values for Recommended Practice and Common Practice. Although Recommended Practice and Common Practice system load curves are specified in Annex A and Annex B, they are not specified in the body of the standard.

- Section 8.3 does not specify the method to determine the intersection of the rating system curve and the performance curve. It does not state whether the rating point is to be determined graphically or by implementing curve fit representations of the performance curves. A computer program to determine the intersection of the curves would provide a consistent method for manufacturers to provide rating data.

- Standard C823 introduces the terms “Recommended Practice” and “Common Practice”. AHRI is of the opinion that “Common Practice” condones poor installation of systems. Energy savings seems to be one of the purposes of Standard C823. Therefore, the Standard should not legitimize any poor practice. Instead, the standard should only focus on recommended practices.

- Annex B, Consolidated Reporting Template, provides an example where the System Configuration Performance column describes cooling modes in tons. A furnace or air handler only provides air flow. Tons is a measure of cooling capacity that is determined by the additional specification of the evaporator and condenser units. A conversion factor is needed to convert airflow to tons for cooling mode rating points.

If you have any questions or wish to discuss this further, please do not hesitate to call me at (703) 600-0383.

Sincerely,

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