

## Ingersoll Rand Comments on Furnace Eligibility Criteria

12/29/2010

Ingersoll Rand Residential Solutions [IRCO], manufacturer of Trane and American Standard residential heating and air conditioning products, appreciates the opportunity to comment on the Energy Star Program Requirements, Product Specification for Furnaces, Eligibility Criteria, Version 3.0: Draft 2 prepared by the U.S. EPA [undated]. The comments follow, keyed to the line numbers in Draft 2.

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### Lines 11-15 Quality Installation

- Ingersoll Rand supports the ACCA/ANSI Quality Installation in principal and in practice, and believes that, for the most part, any elaboration of the QI checklist should be developed by ACCA. We would emphasize that a significant step towards a quality installation is that the installation be performed by NATE-certified technicians.

### Lines 46-52 Furnace Fan Efficiency

- EPA seeks comment on the definition of “e”.
  - “e” is not well defined at this time. This commenter was unable to find it in ASHRAE-103 or in 10-CFR-430 Appendix N.
  - It is suggested that the definition proposed by EPA be revised to read: “The ratio of the blower motor electrical energy consumption to the total energy consumption of the furnace, in the heating mode.”
  - It should be made clear that “e” does not include energy consumption in the circulation mode or the cooling mode.
  - “e” is set at  $\leq 2\%$  in Table 1. This is an appropriate value when defined as suggested.

### Lines 54-57 Air Leakage Definition

- There are actually two definitions here and they are not consistent. The first, in terms of air flow rate, would be expressed in volume (or mass) per unit time. The second is explicitly indicated to be in expressed as a percent.
- ***See the further comment on the table in line 92.***

### Lines 59-60 Heating Degree Days

- HDD are not normally defined quite this way. HDD are defined in terms of the arithmetic average of the daily maximum and the daily minimum temperatures which is not a true mean daily temperature.
- It might be appropriate to define “balance temperature”.

### Lines 69-75 Excluded Products

- If the intent is to exclude weatherized residential furnaces, it would be preferable to say so explicitly.

### Lines 79 ff Marking of Regional Products

- The fact that a given product may be Energy Star qualified in Arkansas but not across the state line in Missouri raises the question of how products, literature, web sites, etc should be marked to designate that a product is Energy Star qualified in one region but not in the neighboring region. When a product leaves the factory, there is generally no way of knowing where it will be installed.

#### Lines 82-86 Definition of Regions

- It would be preferable to have only one form of definition here, that being the definition of regions in terms of the states in each region.
- The degree-day criterion is the metric used to select the states in each region as contrasted to a definition of the region.

#### Line 92 Leakage Requirement

- Equipment air leakage test procedures have not been in existence long enough to have been vetted and subject to a round-robin verification. The most likely candidate test procedure is that of ASHRAE-193-2010, which was just released in June 2010. Review of that standard in the context of furnace testing indicates that substantial disassembly and reassembly of the furnace would be required to employ the test procedure due to the presence of a blower in the furnace. That being the case, it is not clear whether the test is of the leak-tightness of the product as it would be shipped from the factory and installed in a customer's home, or whether it is a measure of the quality of workmanship of the test technician and the design of the test fixtures used to separate the high and low-pressure sections, downstream and upstream of the blower, respectively.
- The EPA requirement for third-party tests as a condition for Energy Star rating after 1/1/2011 further complicates the situation since there are hundreds of candidate Energy Star furnace models and each one would have to be tested. It is estimated that the testing would occupy the better part of a work week with set-up, testing, verification of test results, and tear down.
- If a furnace currently qualified as an Energy Star furnace had to go to a third party lab for leakage testing, what other testing would EPA require to be done at that time.
- It is recommended that the leak test requirement be delayed until the next iteration of the Eligibility Criteria.

#### Line 92 Footnotes to Table 1 would be helpful

- It would be desirable to add footnotes to the 4<sup>th</sup> column and 5th column headings referring the reader to the definitions of 1)D and 1)E.

#### Lines 112-113 "e" metric

- IRCO endorses the use of the "e" metric for blower [fan] energy consumption. This metric, with the definition "tweaked" as suggested in the comment on lines 46-52, puts the blower energy consumption in proper perspective relating it, in effect, to the primary function of delivering the heat from the furnace. The value of  $\leq 2\%$  is appropriate in that context.

#### Lines 133-137 Furnace Cost estimate basis

- The furnace cost estimate basis is put in question by the analysis outputs in lines 145-148, discussed below.

#### Lines 141-143 Payback

- The paybacks would be substantially less favorable than shown if the retail cost and installation cost were adjusted as suggested in the following item.

#### Lines 146-148 Furnace Costs

- Contractors such as ACCA members are perhaps the best source of actual consumer costs for the purchase and installation of furnaces. What do they charge their customers?
- Anecdotal evidence available to the preparers of these comments suggests that the actual costs for an installed furnace are two to three times the figures shown here, and that the price spread is greater.
- Comparing the “retail cost” figures with manufacturer’s selling price to distributors indicates that the presumed retail costs are too low (i.e., either underestimate manufacturer’s selling price or the combined effect of distributor and contractor mark-up and labor costs.).
- Some of the factors that should be considered, if they have not, are:
  - The majority of installations are replacements involving the added costs of removing and disposing of the existing equipment. A fair percentage of these will involve changes in mounting provisions, closing off existing flues, and possibly upgrading electrical service to the furnace.
  - Installation of a sealed-combustion furnace involves addition of a second “flue” for supply of outdoor air for combustion.
  - Upgrading to a condensing furnace in a house with a masonry chimney “orphans” the water heater and the flue for the water heater may need to be reduced in diameter and or lined.
  - Many installations require two technicians in order to place the equipment and may need special material handling equipment.

#### Lines 146-148 General

- The columns need to be aligned.
- Use of significant figures on cost is not consistent.
- We assume that 95.5 is a typo, and that the number should be 95%.
- The fuel uses in the north with 95% AFUE and in the south with 92% AFUE look a bit off based on the equation

$$\text{gas}_2 = \text{gas}_1 \times [\text{AFUE}_1 \div \text{AFUE}_2]$$

- The furnace retail cost [i.e., **price**] increment between 92% AFUE and 95% AFUE is too small due to factors discussed above.
- Units for fuel use should be given.

#### Lines 152-153 Assumptions

- Comments on the assumptions are solicited, but the assumptions are not given.

- The reviewer wonders, for example, if the North/South comparison takes into consideration differences that may exist in the housing stock in terms of
  - Age
  - Insulation standards
  - Regional venting practices
  - Equipment location [attic, basement, on-grade].
  - Size [sq. ft.]

#### Lines 170-171 Configuration adaptability

- Qualification for the Energy Star rating should be based on the performance of the furnace not on the installation configuration or the variety of configurations that the model can accommodate.
- If a furnace installed in the down-flow configuration can meet the Energy Star performance criteria, then it should be rated as an Energy Star furnace, regardless of whether it can be installed in other configurations. Each furnace will ultimately be installed in only one configuration in any given installation, and in existing construction, many of those installations will be down-flow. Denying Energy Star to any of these which meet the performance criteria will discourage the use of high efficiency down-flow furnaces.
- The sentence “Manufacturers cannot ... claim.” Does not say what EPA is presumed to have intended. The Energy Star rating is based on the performance, not on how a given convertible furnace is actually installed. – ***Energy Star on the box means energy Star on the job.***

#### Lines 182-187 Rounding

- The clauses “a.” and “b.” seem to be mutually contradictory. Suppose there are two cases with the following results:
  - Case 1: AFUE is 95.46 which per clause “a.” is rounded to 95.5;
  - Case 2: AFUE is 95.54 which per clause “a.” is rounded to 95.5.

Both cases would be rounded to 95.5 in conformity with clause “a.”, but clause “b.” says that case 1 does not qualify.

Note that these two cases, which are at their respective limits [beyond which the rounding would go in the opposite direction], differ by slightly more than 0.08%. This is a difference of no practical significance, and **clause ‘b.’ should be deleted.**

#### Lines 206-207 Warranty

- There is no question that a warranty provides a measure of consumer protection and adds value to a furnace or other HVAC product. However, specific warranty terms are based on competitive decisions and are not a direct reflection of the quality, integrity or life expectancy of a given product. Beyond some minimum, warranty provisions should not be an Energy Star criterion. Longer or more comprehensive warranties do not differentiate top performers. They do differentiate customer value and that is reflected in the market price of the appliance.

#### Lines 235-239 Revision Schedule

- The proposed schedule is perhaps a bit ambitious.
- It is questionable whether all comments can be satisfactorily resolved within 6 weeks.
- There should be a reasonable lead time, say not less than 9 months, between the publication of final revised requirements and their effective date.
- If the final specification is issued and broadly announced and made available by February 15<sup>th</sup>, then an effectivity date of November 15, at the earliest, is reasonable.

#### Line 246 Affect of Revisions

- Any model which is Energy Star qualified on its date of manufacture should be permitted to be represented as an Energy Star product throughout its life.
- It is recommended that the following be added to the specification: "Literature, catalogs, brochures, and websites created, published or updated after the effective date of new Energy Star standards shall be updated to delete 'Energy Star' notation for products not satisfying the new criteria. Print materials on hand may be used till exhausted. Electronic media shall be updated within 60 days of the effective date of the new standard."

If there are questions about these comments or if an EPA representative wishes to discuss the comments with an Ingersoll Rand representative, please feel free to contact Jim Vershaw [jim.vershaw@trane.com, 903-581-3233], or the undersigned.

Jim Crawford, Consultant  
On behalf of Ingersoll Rand  
Residential Solutions  
[jim.crawford@trane.com](mailto:jim.crawford@trane.com)

Office 903-509-7273  
Mobile 903-520-9049